

Leg.

Text to plates XLII - LVIII

Ellis & Ford

P. R. Cooper.

Parts. 21 - 29.

London 1867

QS 17
1876
E471

19 062 T40

M15247

WELLCOME INSTITUTE LIBRARY	
Coll	
Call	
No.	QS 17
	1876
	E475



22300009125

ILLUSTRATIONS OF THE LOWER LIMB.

DESCRIPTION OF PLATE XLII.

THIS Figure shows the dissection of the superficial vessels, nerves and glands, as well as that of the fascia lata near Poupart's ligament.

The limb being abducted from its fellow, rotated out, and supported with the hip and knee in a semiflexed position, the skin and the subcutaneous fat were removed, whilst the vessels, nerves and glands contained in it were dissected out. The opening for the saphenous vein should then be carefully defined.

SUPERFICIAL VESSELS, NERVES AND GLANDS.

The cutaneous arteries and veins ramifying in the teguments of the top of the thigh are branches of the femoral trunks.

- | | |
|--|--|
| <i>a.</i> Superficial pudic artery. | <i>f.</i> Cutaneous arteries of the thigh. |
| <i>b.</i> Superficial epigastric artery. | <i>g.</i> Cutaneous vein of the front of |
| <i>c.</i> Superficial circumflex iliac artery. | the thigh. |
| <i>d.</i> Saphenous vein. | <i>h.</i> Superficial epigastric vein. |
| <i>e.</i> Superficial pudic vein. | <i>i.</i> Superficial circumflex iliac vein. |

Arteries :—The cutaneous arteries in the groin, like the tegumentary vessels in other parts, are very irregular in their arrangement: their names are taken from their distribution.

The *superficial pudic* artery, *a*, pierces the deep fascia of the limb about the mid-line; or it may come through the saphenous opening, as in the Figure: having entered the fat, it courses upwards

and inwards to end in the integuments of the pubes, penis, and scrotum. See also Plate xxxii.

A second superficial pudic artery, which lies at first beneath the fascia lata, is delineated in Plate xlv., and will be referred to with the anatomy of the femoral artery.

The *superficial epigastric* artery, *b*, appears through the fascia near Poupart's ligament, being sometimes united with the preceding small artery, and ascends in the fat of the belly towards the umbilicus.

The *superficial circumflex iliac* artery, *c*, runs outwards at first beneath the fascia lata, and pierces that membrane towards the outer border of the thigh, to end in the integuments. Two or three offsets enter the fat at intervals; and some accompany the genito-crural and external cutaneous nerves.

Other unnamed small arteries, which accompany the nerves, 4 and 5, and are marked with, *f*, are derived from the femoral trunk lower down in the thigh.

Superficial veins. The companion veins of the superficial arteries above described end for the most part in the saphenous vein.

Internal saphenous vein, d. This large cutaneous vein reaches from the dorsum of the foot to the groin, but only the upper part is laid bare in the dissection. As now seen, the vein ascends, internal to the mid-line of the thigh, to about an inch and a half from Poupart's ligament, where it sinks through an opening in the fascia lata to enter the femoral trunk. Near its ending it receives the superficial pudic, *e*; the epigastric, *h*; and the circumflex iliac vein, *l*. Somewhat lower down in the thigh it is joined usually by two larger branches;—one, *g*, formed by the veins from the outer surface and front of the thigh, and the other by veins from the inner and hinder parts of the limb.

Superficial inguinal glands. These glands in the thigh are placed on the sides of the saphenous vein, and are superficial to the fascia lata. Of a flattened form and reddish colour, they vary much in size and number: in this body they were rather large, and not numerous. They receive the afferent superficial lymphatics from the inner and fore parts of the limb; and trans-

mit efferent vessels through the deep fascia to communicate with deeper lymphatics. Irritation of the surface of the foot, or of the inner part of the leg and thigh, along the course of the saphenous vein, may give rise to swelling and suppuration in this set of glands.

Another group of superficial inguinal glands lies transversely along the line of Poupart's ligament. See Plate xxxii.

Cutaneous nerves. The nerves now laid bare are derived from the lumbar plexus (p. 309); and they will be followed farther in the subsequent dissection of the thigh, with the exception of the ilio-inguinal.

- | | |
|------------------------------------|-------------------------------------|
| 1. Ilio-inguinal. | 4. Middle cutaneous of the thigh. |
| 2. Crural branch of genito-crural. | 5. Branch of the internal cutaneous |
| 3. External cutaneous. | of the thigh. |

The *ilio-inguinal* nerve, 1, issues through the external abdominal ring, and terminates in offsets to the scrotum, and to the integuments of the thigh internal to, and rather below the saphenous opening.

FASCIA LATA AND THE SAPHENOUS OPENING.

The special fascia of the thigh, or the fascia lata, gives a sheath to the limb, and serves for the attachment of muscular fibres at certain points: it is pierced also by apertures for vessels and nerves.

- | | |
|---|---|
| A. Poupart's ligament. | G. Inner sharp edge of the saphenous opening. |
| B. Fascia of Scarpa, cut. | H. Saphenous opening. |
| C. D. Fascia lata. | I. Opaque line of the blood-vessels under the fascia. |
| E. Falciform edge of the saphenous opening. | †† Superficial inguinal glands. |
| F. Inner part of the crural sheath. | |

The *fascia lata* C forms a continuous tube around the thigh, and sends inward processes to form sheaths for the muscles. White lines on the surface indicate the position of the intermuscular septa. Along the front of the thigh is a wider yellowish line, I, which marks the situation of the subjacent femoral vessels.

Only a small part of the fascia is now laid bare, and through it the saphenous vein passes. Outside the opening for the vein the fascia is united above to Poupart's ligament : here it is thick and strong, and serves to keep the ligament tense and closely applied to the parts beneath, so that it assists materially in checking the descent of a piece of intestine beneath that tendinous band. Inside the opening the fascia is much thinner, and is inserted into the pubes.

Most of the apertures in the fascia for the passage of the superficial vessels and nerves are small, but that for the saphenous vein is large, and is called the saphenous opening.

The *saphenous opening*, H, is placed inside the line, I, of the femoral vessels, and is much larger than is needful for the passage of the vein and some other small vessels. Its form is semilunar, with the extremities directed up and down. Its measurements are, one inch and a half to two inches in length, and about half an inch across at the widest part ; but the greater width in the Figure is due to the fascia being raised by the distending with injection the subjacent vessels.

The extremities of the aperture are named cornua : the upper cornu touches Poupart's ligament, and the lower is distant about one inch and a half from that structure.

The edges have different characters :—The outer is crescentic in form, and blends with the subjacent crural sheath F : above, where it is thicker and firmer, it unites with Gimbernat's ligament (part of the insertion of Poupart). To this border, which is not free, though it has a semilunar appearance, the term falciform process or edge has been given ; and the upper part, between E and Poupart's ligament A, has been called by some the femoral ligament. At the inner side of the opening the fascia lata is flattened half the way down over the subjacent pectineus muscle ; but thence to the lower cornu it presents a sharp edge, G, which is continued below into the falciform part of the outer boundary.

In the area of the opening appears the loose membranous crural sheath F. To the sides of the aperture the deeper stratum of the subcutaneous or superficial fatty layer is connected by bands of fibrous tissue ; and as that part, stretching over the opening, is

pierced by many small apertures for lymphatics and vessels, it has been named the *cribriform fascia*.

Through this large aperture pass the saphenous vein, lymphatics, and one or more small superficial vessels: the vein enters nearer the lower than the upper cornu, but the others have not a fixed position.

By means of this aperture a femoral hernia comes forwards, and forms a swelling in the thigh; and as the saphenous opening serves as the aperture of exit of the hernia from beneath the fascia, it answers to the external abdominal ring of the inguinal hernia. The intestine escapes through the upper part of the opening above the situation of the vein, and pushes before it, while protruding, the crural sheath in which it descends, and the thin cribriform fascia placed over that hole. As the hernial tumour enlarges it is directed upwards upon the firm outer margin of the opening—the part above E; and since the gut makes a sharp curve round the fascia it may be constricted at that spot by the thickened falciform process.

The condition of the margins of the aperture as to tightness and looseness depends upon the position of the limb, and on the tension of the rest of the fascia lata. When the thigh is bent and rotated in, the margins of the saphenous opening are rendered lax; but if the thigh is extended and rotated out, the aperture is made tighter and smaller, and the outer edge takes on the characters of a firm constricting band. In an attempt therefore to force backwards a piece of protruded intestine into the abdomen the position of the limb should be specially attended to, for success may depend upon the greatest possible laxity being given to the edges of the saphenous opening.

DESCRIPTION OF PLATE XLIII.

IN this Plate the anatomy of the crural sheath and the course of a femoral hernia may be studied.

To display the crural sheath and its vessels, throw down a triangular flap of the fascia lata. The fat coming into view after the fascia lata is raised should be removed carefully : and the crural sheath should be detached with the handle of the scalpel from Poupart's ligament before, and from a deep piece of the fascia lata beneath it. Cut then transversely through the front of the crural sheath as is shown in the Figure ; and remove a piece of the areolar sheath around the artery and the vein, so as partly to denude those vessels,

ANATOMY OF FEMORAL HERNIA.

As the femoral hernia descends into the thigh it passes beneath Poupart's ligament, and inside the loose crural sheath to the saphenous opening. The anatomy of those parts in the thigh will be described shortly before the hernia is referred to.

- | | |
|--|---------------------------------------|
| A. Oblique part of Poupart's ligament. | F. Crural sheath. |
| B. Horizontal part of the ligament. | G. Femoral artery. |
| C. Fascia lata of the thigh. | H. Femoral vein. |
| D. Reflected part of the fascia. | I. Inguinal gland in the crural ring. |
| E. Pubic part of the fascia. | K. Crural canal. |

Poupart's ligament separates the regions of the thigh and abdomen, and has been described in page 264. From its being attached to bone only at the extremities, and arching over the parts issuing from the abdomen to the thigh, it has received also the name crural arch.

Between its terminal attachments the band is curved down-

wards to the thigh, being oblique in direction externally, and almost horizontal internally. To the lower border the fascia lata is attached ; and as long as this membrane is entire the band is kept arched, but as soon as the fascia has been cut through the ligament becomes lax, and rises towards the abdomen. The space included between the ligament and the hip-bone is closed at the outer end by the large flexor muscles of the hip (psoas and iliacus), and at the inner by the femoral vessels and the crural sheath ; the fasciæ too lining the cavity of the belly assist in closing the interval (Plate xxxv.). Between the ligament and the muscles there is not space for the escape of the intestine from the abdomen, but there is room for its passage in the crural sheath.

Poupart's ligament is rendered more or less resisting by the position of the limb. For instance if the limb is straight, as in standing, the crural arch is tense ; and if the thigh is rotated out at the same time, that band is made as tight as it can be. When the thigh is bent on the abdomen the tendinous cord is relaxed ; and it attains its greatest degree of looseness if the limb is rotated in at the same time. Of necessity this tendinous arch may act as a constricting band to a piece of intestine descending beneath it in femoral hernia.

Deep crural arch. A thin fibrous band across the front of the crural sheath has received this name. It begins about the middle of the superficial crural arch, and widening internally is attached to the pectineal line of the pubes : it consists mostly of a thickening of the membrane forming the fore part of the sheath.

The *crural sheath*, F, is a loose membranous tube around the femoral vessels, and is derived from the fasciæ lining the cavity of the belly. It lies under the inner or horizontal part of the crural arch, filling the interval not occupied by muscle ; and it extends downwards about two inches before it blends with the areolar sheath around the bloodvessels. Upwards, or towards the abdomen, the fore part of the tube may be traced into the fascia transversalis ; and the hinder part is described as being continuous with the fascia iliaca (Plate xxxv.).

Flattened from before back, it is triangular in form, with the base towards Poupart's ligament and the apex around the femoral

vessels. Its outer edge is straighter than the inner. This funnel-shaped tube lies in an interval between two pieces of the fascia lata: in front of it is the reflected part, D, and behind it is a deeper piece of the same fascia, from both which it can be detached with the handle of the scalpel. Perforating it are superficial vessels for the top of the thigh, and the genito-crural nerve.

This tube serves as a casing to the bloodvessels passing from the abdomen to the thigh, and corresponds with a similar sheath on the vessels of the upper limb entering the axilla.

Interior of the crural sheath. On cutting through the front of the crural sheath, as in the Figure, the included space will be seen to be larger than is needed to lodge the femoral vessels; and to be largest internally where the tube slants most.

In the tube are contained the femoral vessels, each invested with a sheath of areolar tissue, together with an inguinal gland. The vessels lie side by side, the artery being external and near to the outer border of the tube; they are united together closely by their areolar investments. When a piece has been cut out of each areolar sheath, as in the Plate, the cut edges on the sides of the vessels will appear like partitions passing from the front to the back, and dividing into parts the contained space. Commonly three such spaces or compartments are described as resulting from two septa in the interior of the crural sheath, viz. an external containing the femoral artery; a middle one, the femoral vein; and an inner space, K, which is partly filled by an inguinal gland.

Through the inner space of the crural sheath a piece of intestine descends in femoral hernia; and names have been given to parts of the passage through which it glides, which resemble the terms applied to parts of the passage for the inguinal hernia. Thus the opening into the crural sheath from the cavity of the belly is the crural ring; the space in the interior of the sheath, inside the vein, is the crural canal; and the saphenous opening in the fascia lata represents the aperture of exit.

The *crural ring*, or the abdominal aperture into the space in the crural sheath, is placed on the inner side of the femoral vessels,

and is on a level with the crural arch. It is about as large as the tip of the fore finger, and measures most from within out : it is closed by the inguinal gland, I, which lies in it, and by the subperitoneal fat (septum crurale) and the peritoneum which stretch across it above the gland.

Its bounding parts, and the vessels around, are described at page 286. (Plate xxxv.)

The *crural canal*, K, is the narrow space inside the crural sheath, which is internal to the femoral vein. It extends from the crural ring to the upper cornu of the saphenous opening, and measures from half to three quarters of an inch in length. It gradually tapers from above down, being pyramidal in form with the base upwards.

Contained in the crural sheath, it will be bounded externally to that tube, both in front and behind by fascia lata ; and it is closed below by the meeting of the femoral vein with the inner slanting side of the crural sheath.

The *saphenous opening* is concealed by the reflected piece of the fascia lata ; but it is delineated in Figure XLII. Its boundaries, size, and conditions, have been described in page 342. By means of this aperture the gut comes forwards to the surface of the thigh ; and this aperture of exit has been called the lower opening of the crural passage.

Course of femoral hernia. The piece of intestine in femoral hernia passes beneath the crural arch and within the crural sheath as before said, but it changes its direction as it proceeds onwards. Entering the crural canal through the abdominal aperture, it descends vertically as far as the upper cornu of the saphenous opening. Next it advances through that opening to the surface of the thigh, making at first a small round tumour, but as more of the gut is protruded it extends transversely below Poupart's ligament. Finally, as the hernia enlarges it ascends over the crural arch on to the abdomen, because there is less resistance in this direction than towards the thigh. In consequence of the winding course of the intestine the last or ascending part comes to be parallel almost to the first or descending part of the tumour ;

and the two are united below by a curve around the sharp margin of the saphenous opening. In attempts to reduce a large femoral hernia the bend in the course is to be specially remembered, and the contents of the constricted gut are to be directed down and back to the upper part of the saphenous opening.

Whilst the intestine remains in the crural canal the hernia is said to be incomplete; but if the gut has escaped from the canal, and forms a tumour on the surface, the hernia is called complete.

Coverings of the hernia. The investments applied to the intestine as it descends are derived partly from strata in the abdomen, and partly from structures in the thigh. In the first place the gut receives a sheath from the peritoneum, which forms the sac of the hernia. In the next place it pushes onwards and elongates the layer of subperitoneal fat (septum crurale) as it enters the crural ring; and it causes the inguinal gland to be pushed aside or absorbed. With those two strata derived from the abdomen it traverses the crural canal as far as the saphenous opening; and at that point it will obtain the next two coverings, viz. those of the crural sheath and the cribriform fascia, though it may burst through one or both of these. And lastly it stretches and forms coverings for itself of the subcutaneous fatty layer and the skin.

Six layers are thus enumerated as the coverings of a complete femoral hernia. In a recent tumour the several strata may be separated from each other; but in an older large hernia the coverings derived from the septum crurale and the crural sheath are conjoined, and form the fascia propria of Cooper. During an operation the surgeon may be able to recognise only four, viz. the skin and the subcutaneous fatty layer, the fatty subperitoneal covering, and the peritoneal sac.

Diagnosis. The tumour of a complete femoral is generally smaller than that of an inguinal hernia; and its deeper part or neck can be traced down to the hollow at the upper and inner part of the thigh, that is, to the upper cornu of the saphenous opening. Should it be larger in size, it extends transversely along the line of Poupart's ligament, instead of descending towards the

scrotum as in the inguinal hernia. It can be distinguished with certainty from the inguinal hernia by the position of its neck beneath the crural arch ; and if the finger can detect the cord of Poupart's ligament passing over the neck of the tumour there cannot be any doubt of the hernia being femoral.

Taxis and truss. Before attempts are made to replace the intestine in the cavity of the abdomen, the limb is to be raised and rotated in, and the shoulders are to be elevated at the same time, with the view of relaxing to the utmost the rigidity of the fibrous structures amongst which the intestine passes. Then pressure is to be made with one hand to the fundus of the tumour, whilst the first two fingers of the other are to be applied to the neck of the hernia to direct the contents of the intestine round the falciform edge of the saphenous opening, and upwards along the crural canal to the cavity of the abdomen. Whilst practising the manipulation the force employed is to be moderate but sustained. If the tumour has extended upwards on the abdomen it should be brought downwards towards the saphenous opening, in order that the bend around the falciform process of the fascia lata may be lessened.

After the hernia has been reduced its re-descent is to be stopped by a truss : but as the pad of this instrument cannot compress the internal crural ring, through which the intestine begins to descend, it is to be placed below Poupart's ligament, over the upper and inner part of the saphenous opening.

External stricture. The strangulation of the intestine will be produced generally by a constricting fibrous band across and outside the neck of the sac of the hernia. The seat of the constriction may be at the level of Poupart's ligament or of the saphenous opening, but both are near together, the spots being only about half an inch apart. In the former situation it is occasioned by the firm edge of the band formed by Gimbernat's ligament and the crural arch ; and in the latter, by the sharp margin of the falciform part of the fascia lata.

This stricture may be relieved, without opening the sac of the hernia, by cutting down to the upper and inner part of the neck of the tumour, just below Poupart's ligament, and by incising all

constricting bands external to the sac, whether at the saphencus opening or at Gimbernats ligament. After the division of the external stricture, a slight degree of force will suffice to replace the intestine in the cavity of the abdomen.

Internal stricture. Stricture exists sometimes inside the sac of the hernia. In this case the constriction is produced, as in inguinal hernia (p. 276), by a thickening of the peritoneum of the neck of the sac, so as to form a band which diminishes the space in the interior, and impedes the passage both of the intestinal contents, and of the blood in the wall of the intestine. Its position is opposite the line of Gimbernats ligament and the crural arch.

As the kind of strangulation cannot be determined beforehand, the coverings of the hernia are to be divided at the neck of the tumour, as in the case of the external stricture; and if the sac cannot be emptied of its contents after cutting through all constricting parts external to it, the intestine is to be relieved from internal stricture by opening the peritoneal sac, and, the knife being introduced on a director beneath the thickened band, by cutting horizontally inwards towards Gimbernats ligament. In executing this last part of the operation the surgeon does not see what the knife cuts, and therefore he uses it sparingly, for as soon as the string-like band is divided the intestine becomes free to be passed into the abdomen.

In Plate xxxv. an inner view is given of the crural ring with the vessels around which may be endangered in an operation; and in page 289 are detailed the precautions to be taken in setting free the gut from internal stricture.

SUPERFICIAL VESSELS AND NERVES.

The cutaneous vessels and nerves which are figured in this Plate have been described in page 339; and they are marked for the most part with the same letters and figures of reference as in the preceding Plate. Consequently only their names will be given in the subjoined tables.

VESSELS.

- | | |
|--|---|
| <p><i>a.</i> Superficial pudic artery.</p> <p><i>b.</i> Superficial circumflex iliac artery.</p> | <p><i>c.</i> Cutaneous arteries of the front of the thigh.</p> <p><i>d.</i> Internal saphenous vein.</p> <p><i>e.</i> Superficial pudic vein.</p> |
|--|---|

NERVES.

- | | |
|--|---|
| <p>1. Ilio-inguinal nerve.</p> <p>2. Crural branch of genito-crural.</p> | <p>3. External cutaneous of the thigh.</p> <p>4. Middle cutaneous of the thigh.</p> |
|--|---|

DESCRIPTION OF PLATE XLIV.

A SURFACE view of the muscles of the fore and inner parts of the thigh, with the cutaneous nerves placed in position after being dissected.

The common mode of proceeding with the dissection of the thigh has been here departed from, with the view of keeping within bounds the number of the Plates. Usually the subcutaneous nerves and vessels contained in the fat are first traced out. Scarpa's space at the top of the thigh is next laid bare, and the fascia lata is then removed to bring into view the muscles. If it is wished to study Scarpa's space separately from the rest, let the lower two thirds of the Plate be covered with a piece of paper.

SUPERFICIAL NERVES AND VESSELS.

The cutaneous nerves of the front of the thigh are either direct offsets of the lumbar plexus, or are derived from branches of that plexus.

- | | |
|---|---|
| <p>1. Ilio-inguinal nerve.</p> <p>2. Crural branch of genito-crural.</p> <p>3. External cutaneous.</p> <p>4. Anterior crural trunk.</p> <p>5. Internal cutaneous of the thigh.</p> <p>6. Anterior branch of internal cutaneous.</p> | <p>7. Inner branch of internal cutaneous.</p> <p>†† Offsets of internal cutaneous.</p> <p>8. Middle cutaneous of the thigh.</p> <p>9. Offset of internal cutaneous to the patellar branch of the saphenous.</p> |
|---|---|

10. Patellar branch of the saphenous.
 11. Internal saphenous nerve.

12. Offset of saphenous to the leg.
 13. Superficial part of the obturator.

(i) *Ilio-inguinal nerve*, 1. This small branch of the lumbar plexus has been noticed in page 309; and it has been delineated in the preceding Plates.

(ii) *Genito-crural nerve*. The crural part, 2, of this nerve issues beneath Poupart's ligament at the spot here indicated, when it is larger than usual; but commonly it lies nearer to the femoral vessels, as shown in Plate XLIII., where it is seen to perforate the crural sheath. It comes through the fascia lata near Poupart's ligament, and ramifies in the fat about half way down the thigh. Before or after it pierces the fascia it joins the middle cutaneous nerve, 8; and in the body used for the dissection, a junction took place under the fascia lata with the external cutaneous nerve, 3.

(iii) The *external cutaneous nerve*, 3, leaves the abdomen beneath the outer end of Poupart's ligament, and becomes subcutaneous about four inches from that band. It extends in the fat as low as the knee, and supplies branches to the outer and hinder parts of the thigh, behind a line drawn from the front of the iliac crest to the outer edge of the patella. One or two small branches pierce the fascia lata at a point higher than the trunk of the nerve. *It gives a piteal br wh winds round outer side of thigh.*

(iv) *Anterior crural nerve*, 4. This large trunk of the lumbar plexus (p. 309) passes from the abdomen below Poupart's ligament; and *between plexus & diaphragm & under iliac fascia,* lying outside the crural sheath, divides into cutaneous and muscular branches. The superficial branches are the three following, viz. the internal and middle cutaneous, and the internal saphenous. The muscular branches are shown in Plate XLVI.

(a) The *middle cutaneous of the thigh*, 8, enters the fat about three inches from Poupart's ligament: it extends to the knee along the centre of the thigh, distributing offsets laterally, and ends in the integuments over the patella. Most commonly the nerve is subdivided into two; or there may be two distinct nerves.

(b) *Internal cutaneous of the thigh*, 5. Springing from the anterior crural with the preceding, it descends beneath the fascia lata and along the edge of the sartorius, or under the muscle, as far as

the junction of the upper and middle thirds of the thigh, where it divides into two parts, which are distributed as below :—

- (α) The anterior branch, 6, winds forward over the sartorius, ^{accompanying infl} A, ^{saphen vein} and piercing the fascia lata in the lower third of the thigh, supplies the integuments as low as the inner side of the knee : it joins the patellar branch of the great saphenous nerve by the offset, 9.
- (β) The inner branch, 7, courses under, and along the hinder border of the sartorius to the inner side of the knee, where it is transmitted through the fascia lata ; when cutaneous it is continued in the fat along the inner part of the calf of the leg, about half-way down. Near its beginning it is joined by a branch, 13, of the obturator nerve, and on the inner part of the knee there is a uniting branch, 9, between it and the great saphenous nerve.

From the trunk of the nerve before it divides, or from its anterior branch, offsets marked thus, †, are furnished to the integuments of the inner part of the thigh in the upper half.

- (c) The *internal saphenous nerve*, 11, lying at first beneath the sartorius, as is seen in Plate XLV., escapes from beneath that muscle at the inner side of the knee ; and is continued with the vein of the same name through the leg to the foot. As it becomes cutaneous it gives forwards one offset to the integuments of the front of the leg, and another backwards to join the inner branch, 7, of the internal cutaneous.

Whilst the saphenous nerve is covered by the sartorius in the lower third of the thigh it supplies a *patellar branch*, 10, to the integuments of the inner and fore parts of the knee : this pierces the sartorius and the fascia, and being joined by an offset, 9, of the internal cutaneous, communicates in the fat with the middle and external cutaneous nerves, forming a plexus—the patellar.

- (γ) *Part of the obturator nerve.* The superficial part, 13, of the obturator nerve comes forwards beneath the adductor longus muscle, H, and is inclined outwards under the sartorius muscle and the fascia lata to the femoral artery (Plate XLV.). It communicates with the internal cutaneous branch, 7, beneath the fascia ; and some small offsets are prolonged through the fascia to the integuments on the inner side of the thigh.

Superficial vessels. Small arteries, for the most part unnamed ; and the internal saphenous vein and its tributaries ramify in the fat of the thigh.

Cutaneous arteries. All the cutaneous nerves are accompanied by superficial arteries ; but as these are small, and not so easily traced as the firmer nerves, they were not dissected farther than was necessary to give an idea of their main parts.

Ramifying with the ilio-inguinal nerve, 1, is a branch from the cremasteric artery ; with the genito-crural nerve, 2, and external cutaneous, 3, are branches from the superficial circumflex iliac ; with the middle cutaneous, 8, and internal cutaneous, 5, are small branches of the femoral trunk ; with the saphenous nerve, 11, and with its branches, 10 and 22, are offsets of the anastomotic artery ; and with the obturator nerve, 13, runs a small branch of the internal circumflex artery.

Other cutaneous arteries issue beneath the edges of the sartorius muscle, being furnished from the femoral trunk ; and many small offsets, piercing the fleshy fibres of the vasti and rectus, come from the vessels to those muscles.

The *internal saphenous vein*, *p*, lies in the fat with the superficial nerves along the inner part of the thigh. Below, it passes the knee-joint on the inner side, behind the prominence of the inner condyle, and ascends obliquely to the level of the hip-joint, where it pierces the fascia lata to join the deep vein. See Plate XLII. Large unnamed branches join it about the knee, and smaller veins enter it in the thigh ; and it receives near its ending the named veins accompanying the small superficial arteries of the groin.

SCARPA'S TRIANGULAR SPACE.

The triangular interval at the top of the thigh answers to the axilla in the upper limb. It is a rather shallow, intermuscular space, which is situate on the flexion-side of the hip-joint, and contains the main vessels of the limb, with the nerve of the front of the thigh.

Position, homology, & general features.
Boundaries. Its boundaries are the following :—The base, directed upwards

to the abdomen, is limited by Poupart's ligament : in the dissected limb this band forms a straight line, but before the removal of the fascia it arches down below the level of the arteries, *b* and *c*, and diminishes the length of the space. The apex is formed by the meeting of the sartorius, A, and adductor longus, H, and points to the inner side of the mid-line of the thigh.

Towards the surface this space is closed by the strong fascia lata, and by the teguments and the inguinal glands : this covering will vary in thickness according to the quantity of fat in the body. The floor or the deep boundary is limited by the iliacus, D, and psoas, at the outer part ; and at the inner part, by the pectineus, G, adductor longus, H, and still nearer the femoral vessels by a small piece of the adductor brevis.

The hollow is deepest near the middle, where the blood vessels lie, and gradually becomes shallower from that point towards each side. It contains the femoral artery and vein, with their first branches, the anterior crural nerve, and lymphatics and fat.

The femoral artery, *a*, lies along the centre or deepest part of the intermuscular interval, resting above on the psoas muscle, and furnishing the large profunda and small superficial branches: it leaves the space below by sinking under the sartorius, about an inch outside the apex.

The femoral vein, *m*, lies close to, and on the inner side of the artery, gradually winding beneath that vessel near the sartorius muscle. Like the artery it is most superficial at Poupart's ligament ; and at that spot it rests on the pubes, between the pectineus and psoas muscles. In the space it is joined by the saphenous or superficial, and by deep veins.

The anterior crural nerve, 4, enters the space on the outer side of the artery, and may lie close to that vessel, as in the Plate, or at a short distance from it (quarter to half an inch). Above it lies deeply between the iliacus and psoas, and is separated from the artery by a slip of muscular fibres. About two inches from Poupart's ligament it breaks up into superficial and muscular branches ; but before this final division it sends one or two small branches beneath the femoral vessels to the pectineus muscle.

Deep lymphatics lie around the femoral vessels, and receive

Coverings

Floor

contents.

(i) *Fem. ar.*

(ii) *Fem. v.*

(iii) *ant. cr. nerve.*

superficial lymphatics near Poupart's ligament ; upwards they are continued into the abdomen.

SURFACE MUSCLES OF THE FRONT OF THE THIGH.

Only one muscle—the sartorius, A, is completely laid bare in the surface view of the fore and inner parts of the thigh. Inside or above the sartorius are two groups of muscles, the flexors of the hip and adductors of the thigh ; and outside the sartorius lies the extensor group of the knee. Altogether at the upper and outer part appears a small muscle (tensor vaginæ femoris), which belongs to the abductor or gluteal set of muscles.

A. Sartorius muscle.
B. Tendon of the sartorius.
C. Tensor vaginæ femoris.
D. Iliacus muscle.
E. Rectus femoris.
F. Vastus internus.

G. Pectineus muscle.
H. Adductor longus.
I. Gracilis muscle.
J. Tendon of adductor magnus.
X. Spot for ligature of the femoral artery.

The *sartorius*, A, is the longest muscle in the body. It crosses obliquely the thigh from the hip-bone on the outer side to the tibia on the inner, and lies in a hollow between the adductors of the thigh and extensors of the knee.

Attachments. The muscle is narrow at its origin, and is attached to the upper iliac spinous process, and to half the notch between the two spinous processes. The fibres form a thin widened belly on the thigh, and end below in a short flat tendon, B, which is inserted into the inner surface of the tibia near the tubercle : from the upper border of the tendon one expansion is continued to the knee-joint capsule, and from the lower border another is prolonged to the fascia of the leg.

Relations. The sartorius conceals the greater part of the femoral vessels, and the branches of the anterior crural nerve. It rests on the following muscles :—along the inner edge, from above down, come the iliacus, D, pectineus, G, adductor longus, H, gracilis, I, and the inner hamstrings ; and along the outer edge are the tensor vaginæ femoris, C, rectus, E, vastus internus, F, and tendon of the adductor magnus, J. Just above the knee it

bounds the popliteal space with the inner hamstrings; and this part is pierced by the patellar branch, 10, of the saphenous nerve.

The action of the muscle is exemplified in the posture of squat-^{act}ing. By its contraction the hip-bone is drawn forwards, the tibia backwards, and the fascia lata is rendered tense at the same time. If the pelvic end is fixed and the tibia free, the knee-joint will be bent; and if the tibial extremity becomes the fixed point the pelvis will be supported and drawn forwards. In standing on one leg, say the right, the muscle of the same side will assist in turning inwards the pelvis on the top of the femur, and in rotating the trunk to the left side: with the left muscle acting in the same way the trunk will be moved in the opposite direction.

Flexor muscles of the hip-joint. These are two in number, viz. the psoas and iliacus (p. 296); but only the latter, D, is now visible, as the psoas is concealed by the femoral artery. Both arise in the abdomen, and issue thence beneath Poupart's ligament to be inserted into, and in front of and below the small trochanter of the femur.

The *adductor muscles of the thigh* form the large fleshy mass at the inner side of the femur; they are five in number, but only three, viz. pectineus, G, adductor longus, H, and gracilis, I, are in contact with the fascia. All will be more completely laid bare in subsequent Plates; and in Figure XLVII. the deeper members of the group are exhibited.

The *extensors of the knee-joint* are three large muscles, which make the bulge on the fore part of the thigh: they consist of rectus femoris, E, vastus internus, F, and vastus externus (L, Plate XLVI.). Above, they are concealed for a short distance by the sartorius, A, and tensor vaginæ femoris, C; and below, they blend in a common tendon, which is continued over the knee-joint to the tibia. Plate XLVI. is specially devoted to the anatomy of these muscles, and of the vessels and nerves belonging to them.

DESCRIPTION OF PLATE XLV.

THE anatomy of the femoral vessels and anterior crural nerve may be acquired from this Figure.

After the completion of the dissection for the preceding Plate the chief nerve and vessels on the front of the thigh will be brought into view by removing the cutaneous nerves, and by taking away the greater part of the sartorius muscle. On the removal of the fat and an aponeurosis beneath the sartorius the nerve and vessels will be visible.

SURFACE MUSCLES OF THE FRONT OF THE THIGH.

The connections of the several superficial muscles can be perceived in this Figure; but the description of each will be given subsequently with the group of muscles to which it belongs: they are marked by the same letters of reference as in Plate XLIV.

A. Ends of the sartorius.	G. Pectineus.
B. Gluteus maximus.	H. Adductor longus.
C. Tensor vaginae femoris.	I. Gracilis.
D. Iliacus.	J. Adductor magnus.
E. Rectus femoris.	K. Semi-membranosus.
F. Vastus internus.	

FEMORAL ARTERY AND VEIN.

The main blood vessels of the lower limb, like those of the upper, are large single trunks as far as one bone reaches in the member, and divide into branches in the leg where two bones are present.

- | | |
|----------------------------------|---------------------------------------|
| a. Femoral artery. | i. Superficial branch of anastomotie. |
| * Spot for ligature. | † Cutaneous arteries of the femoral. |
| b. Circumflex iliac branch. | j. Ending of external iliac artery. |
| c. Epigastric branch. | k. Femoral vein. |
| d. Superficial circumflex iliac. | l. Superficial pudic vein. |
| e. Superficial pudic. | n. Deeper superficial pudic. |
| f. Deeper superficial pudic.] | o. Profunda. |
| g. Profunda artery. | p. Saphenous vein, cut. |
| h. Anastomotie artery. | |

The *femoral artery*, *a*, is continuous directly with the external iliac, and reaches beyond the knee, like the brachial beyond the elbow, before it breaks up into secondary trunks. Its extent is marked in one direction by the lower border of Poupart's ligament, and in the other by the opening in the adductor magnus: finally it turns to the back of the limb by this aperture, and obtains the name popliteal.

Its course in the limb is oblique; for near the pelvis the vessel lies over the hip-joint, whilst it is placed inside the femur below. And its position in the thigh would be marked by a line on the surface from midway between the symphysis pubis and iliac crest to the prominence of the inner condyle of the femur, when the knee is half bent, and the thigh bone rotated out. Pressure applied to the artery in the middle third of the thigh should therefore be directed outwards towards the femur; and when employed above, it must be made directly backwards against the hip-bone.

At the top of the thigh the vessel is near the surface and is uncovered by muscle, but in the rest of its extent it is concealed by the sartorius (see Plate XLIV.). In the description of its connections the artery will be divided into a superficial and a deep part.

The *superficial part* (Plate XLIV.) is contained in Scarpa's triangular space, and measures from three to four inches in length according to the width of the sartorius muscle. It lies nearly in the centre of the space, and its position in the limb may be ascertained by means of the upper part of the line before given for the course of the femoral trunk.

At first the artery is encased in the crural sheath with the femoral vein (Plate XLIII.). Between it and the surface of the limb lie the common teguments with inguinal glands, and the

origin.

Extent

course.

(relation bone)

In Scarpa's triangle

position

Relation

(a) integument & gland

fascia lata. The vessel rests at first on the psoas muscle, and is placed lower down over the pectineus, G, but at some distance from it, the profunda and circumflex vessels with fat intervening.

To the inner side and close to the artery lies the femoral vein, which inclines gradually behind that vessel towards the apex of the space.

Outside the artery, either close to, or at a little distance from it, is the anterior crural nerve: this divides into many branches in the space of Scarpa; and of these, the internal cutaneous, 5, crosses over the artery near to or beneath the sartorius.

The *deep part* of the artery (Plate XLV.) is contained in an intermuscular interval on the inner side of the femur, which has been called Hunter's canal. Superficial to the vessel in this hollow is the sartorius, A; with an aponeurotic layer beneath that muscle, which is stretched between the vastus internus, F, and the adductor longus and magnus muscles, H and J: this layer does not appear in the Figure, as it was removed in the dissection. Beneath the vessel lie the adductors, viz. pectineus, G (the lower end), adductor brevis (a small piece), adductor longus, H, and adductor magnus, J. On the outer side is the vastus internus, which separates the artery from the femur. Inferiorly the artery issues from that space through the aperture in the adductor magnus muscle.

The femoral vein is closely applied to the artery throughout, and winds behind it from the inner to the outer side. The superficial or internal saphenous vein has a position inside the blood vessel, but oftentimes an external branch of that vein crosses the line of the artery (Plate XLII. g).

The internal saphenous nerve, 13, runs with the artery; it is outside that vessel above, but inside below, and crosses beneath the aponeurosis over the artery.

Position and size of the branches. Most of the unnamed branches of the femoral artery are small in size and cutaneous, and arise at tolerably regular intervals along the trunk. From the beginning come three small named branches (Plate XLII.), viz. superficial epigastric, *b*, circumflex iliac, *c*, and pudic, *a*. Two inches lower down arises the large profunda trunk, *g*, for the supply of

(b) muscles

(c) vein

(d) nerve
ant. crur.

3 in Hunter's
canal.

(e) superficial
saphenous

deep relations

(f) to other
contents of
Hunter's canal
(i) vein

(ii) int. saphenous
nerve

Branches

the thigh. And close to the ending springs the small anastomotic artery, *h*, for the knee-joint.

Of these branches the profunda is the largest; and to it the term deep femoral has been given. It arises commonly from the second inch of the femoral trunk, varying much as to its site within that limit; but its origin takes often a much wider range as the observations of Mr. Quain have demonstrated.* Thus it may be attached to the first inch of the femoral, or even higher, so as to come from the end of the external iliac. Or it may leave the parent vessel lower in the thigh, arising as far as four inches from Poupart's ligament; but in this state of deviation its circumflex branches are usually attached higher up and separately to the femoral trunk. As the beginning of this large vessel ranges then over the upper four inches of the femoral artery a ligature cannot be applied to that part of the vessel without the prospect of subsequent hæmorrhage.

Ligature of the femoral. As this vessel, like the artery of the upper limb, is conveniently placed for the employment of pressure to control the circulation of the blood, the operation of tying it with a thread for the treatment of aneurism in the popliteal space will be resorted to but rarely; but should such a proceeding be required the following directions may be useful in its execution.

The spot chosen for ligature is determined by the place of origin of the profunda, as the surgeon desires to place the thread on the femoral trunk beyond that large nutritive and anastomotic branch. But as the origin of the profunda wanders over the highest four inches of the femoral artery, a spot between four and five inches from Poupart's ligament, which is marked thus, X, in the Figure, is to be selected as the most suitable for that operation, even though the vessel is not so accessible as it would be in Scarpa's triangular space.

The position of the femoral artery in the limb may be ascertained by a line on the surface from the mid point between the iliac crest and the symphysis pubis to the inner condyle of the

* In the work before referred to on the Surgical Anatomy of the Arteries.

femur, the hip and knee-joints being slightly bent at the time, and the thigh rotated out. This line is to serve both as the superficial and the deep guide; and if it is not accurately taken and strictly kept some difficulty may be experienced in finding the artery, as there is not any deep part to direct the operator to the position of the blood vessel.

In executing the steps of the operation the fore finger of the left hand is placed opposite the part of the vessel to be tied, and the knife incises the integuments for three inches, the centre of the cut being marked by the finger; and as there may be a large branch of the saphenous vein crossing the artery the knife should be used cautiously at this stage. The fascia lata should next be cut for the same extent as the skin and fat. Then the fibres of the sartorius, which are inclined downwards and inwards, will appear in the bottom of the wound. This muscle is next to be reflected with care from the artery, and to be drawn to the outer side of the wound; and underneath the spot occupied by the sartorius the femoral artery may be recognised during life by its pulsation, and in the dead body by its colour.

The next step is to detach the artery from the surrounding parts. For this purpose seize the areolar sheath with a forceps, and open it with a part of the scalpel at some little distance from the point, avoiding if possible the internal cutaneous nerve. The sheath being still held in the forceps, separate the artery from this and the companion vein by a blunt instrument, such as a director, introduced through the opening in the areolar investment.

Raising the sheath with the forceps the operator introduces the aneurism needle between the artery and vein; and then elevating the opposite side of the sheath, he passes the instrument gently round the artery. Finally setting free the thread from the needle in the usual way, the surgeon ligatures the femoral trunk; but in the living body he ascertains beforehand that the vessel pulsates on compression with the finger. Gentleness and tact are required in passing the needle, lest the instrument should pierce either of the large blood vessels; but if the aneurism needle is carried from right to left, puncture of either is less likely to happen than if it is moved in the opposite direction.

Should the artery be deprived of its sheath to a greater extent than is needed for the passage of the aneurism needle, it should be secured by two ligatures—one at each end of the denuded part.

On reaching the artery the operator may find the origin of the profunda at that point, or possibly, though but rarely, the femoral trunk split into two ;—In each case he would include both vessels in ligatures.

Usually the femoral vein is not seen in the operation specified ; but if it is split, or if one of its pieces crosses over the artery, it may be in the way of the knife in opening the sheath.

Branches of the femoral artery. The first three branches are small and cutaneous, and are named superficial *pudic*, *epigastric*, and *circumflex iliac* : these have been noticed with Plate XLII. Another superficial pudic branch is the following :—

The *inferior* or deeper *superficial pudic* arises from the femoral trunk rather lower ; it runs beneath the fascia lata and the gracilis muscle to the inner side of the thigh, where it ends in the teguments of the limb and scrotum, and in the labium pudendi of the female. Small collateral offsets are furnished to the muscles with which it is in contact.

The *profunda artery, g*, arises about an inch and a half below Poupart's ligament, and descends in the thigh beneath the femoral artery, as is shown in Plate XLVII. It supplies large nutrient and anastomotic branches to the thigh.

Cutaneous and muscular branches. The small arteries to the integuments which are marked thus, †, have been described in page 354. The muscular branches from the femoral trunk are but few : they enter the vastus internus, sartorius, and adductor longus.

The *anastomotic artery, h*, springs from the end of the femoral, and is continued between the vastus internus and the tendon of the adductor magnus to the inner side of the knee : here it ramifies under the aponeurotic investment of the joint, and anastomoses with the other articular arteries. Offsets are given by it to the vastus internus, one crossing the lower end of the femur above the joint.

A superficial branch of the anastomotic, *i*, accompanies the trunk of the saphenous nerve beneath the sartorius, and ends in the integuments with that nerve.

The *femoral vein*, *k*, is the companion to the artery, and has the same extent. Closely united throughout to the artery it changes its position to that vessel about the middle of the thigh, for it is on the inner side above, but on the outer side below. Near Poupart's ligament it is placed over the interval between the psoas and pectineus, but farther in the thigh it has connections with parts around like those of the artery.

Its branches are similar for the most part to those of the artery, but they have been taken away in the progress of the dissection. Near the top of the thigh it receives in addition the superficial or saphenous vein; and at the same place it is joined by the small vein, *n*, accompanying the deeper of the two superficial pudic arteries.

ANTERIOR CRURAL NERVE.

This large nerve of the lumbar plexus (p. 309) divides in Scarpa's triangular space into a superficial and a deep set of branches.

The *superficial set* consists of internal cutaneous, middle cutaneous, and internal saphenous; but as the middle cutaneous has been noticed sufficiently with Plate XLIV. it will not be referred to again.

The *internal cutaneous nerve*, 5, inclines beneath the sartorius to the inner side of the thigh, and divides into two parts, anterior and inner.

The anterior part, 6, is delineated in Figure XLIV., and its description is given in page 353.

The inner part, 7, descends along the inner border of the sartorius nearly to the knee, where it becomes a cutaneous nerve of the leg (Plate XLIV.). Near its beginning it is joined by an offset from the obturator, 15; and lower down (occasionally) by a branch, 8, from the internal saphenous. See also p. 353.

The *internal saphenous nerve*, 13, courses beneath the sartorius, and at the insertion of that muscle becomes cutaneous below the

knee : it is then continued through the leg to the foot. For two-thirds of its extent in the thigh it accompanies the femoral vessels, crossing over them from the outer to the inner side, and lying under the aponeurotic layer over them ; but beyond the opening in the adductor magnus the superficial branch, *i*, of the anastomotic artery runs with it.

One or two branches are furnished by the nerve :—an occasional offset, 8, communicates with the internal cutaneous nerve ; and a large patellar branch, 14, pierces the sartorius to ramify in the teguments over the knee (p. 353).

The *deep set of branches* of the anterior crural are furnished to muscles ; they supply the extensors of the knee-joint, and the sartorius and pectineus.

The branch to the sartorius, 3, has been separated from its muscle ; oftentimes an offset of the middle cutaneous enters the sartorius.

The nerve to the rectus, 9, has been cut through as it penetrates the muscular fibres.

The nerve to the vastus internus, 11, pierces the fleshy fibres about the middle of the thigh. As it is about to enter it gives a slender articular branch, 12, to the knee-joint, which runs on the surface of the vastus, covered at places by some fleshy fibres, and accompanies lower down the anastomotic artery to the joint. In this body a second articular branch issues from the fleshy fibres nearer the knee.

The nerve to the vastus externus, 10, will be described with the following Plate.

The nerves to the pectineus, 2, one or two in number, arise higher than the rest, and cross beneath the femoral vessels to be distributed to the muscle : for their ending, see Plate XLVI.

Obturator nerve, 15. A small part of this nerve is included in the dissection, but its distribution is visible in Plate XLVII., with which it will be described.

DESCRIPTION OF PLATE XLVI.

THIS Illustration shows the dissection of the deep muscles of the fore and outer parts of the thigh, with their vessels and nerves.

The thigh having been prepared for the drawing of the preceding Figure, the dissection for this Plate will be completed by cutting through the rectus muscle, and removing the fat from the branches of the external circumflex artery and anterior crural nerve. With the handle of the scalpel the outer vastus, L, may be separated above from the inner vastus, F, where vessels and nerves intervene; and the thin aponeurosis, O, which is continued from their common tendon over the knee-joint, may be cut through and raised to the sides of the knee. All the fascia lata on the outer part of the thigh is to be removed, except a narrow slip with the insertion of the tensor vaginæ femoris.

MUSCLES OF THE FRONT OF THE THIGH.

The chief fleshy mass on the front of the femur is formed by the three parts or heads of the extensor of the knee-joint; but at the upper and outer parts of the thigh are the small tensor vaginæ femoris, and the gluteal muscles.

A. Sartorius, cut.
B. Gluteus medius.
C. Tensor vaginæ femoris.
D. Iliacus.
E. Rectus femoris, cut.
F. Vastus internus.
G. Pectineus.
H. Adductor longus.

K. Adductor brevis.
L. Vastus externus.
M. Gluteus minimus.
N. Ligamentum patellæ.
O. Expansion from the extensor tendon of the knee.
P. Tendon of the extensor cruris.

The *tensor vaginæ femoris*, C, is a small muscle, which is

attached by one end to bone, and by the other to the fascia lata. It takes origin from the upper iliac spinous process, from the contiguous part of the iliac crest, and from half the notch between the two iliac spinous processes ; reaching downwards at the outer side of the thigh, it is inserted into the fascia lata where the upper and middle thirds meet.

The muscle is incased in strong fascia, and is placed between the gluteus medius, B, behind, and the sartorius, A, and rectus, E, in front. Underneath it lies the upper part of the vastus externus, L, and the ascending branches, *f*, of the external circumflex artery. A small nerve, 1, and arterial offsets enter the under surface.

The muscle can abduct the thigh from the other limb, and make tense the fascia, deriving from this circumstance the name tensor of the fascia lata. After the thigh has been rotated out the muscle will act as an internal rotator of the femur.

The *extensor of the knee* (triceps extensor cruris) consists of three separate parts or heads, viz., rectus femoris, E, vastus internus, F, and vastus externus, L, which are united below in a common tendon.

Rectus femoris, E (Plate XLV.). This spindle-shaped muscle forms the middle or long head of the extensor. It arises from the hip-bone by two tendinous pieces :—one is attached to the anterior inferior iliac spinous process ; and the other, longer and wider, is fixed to the depression above the acetabulum. Inferiorly the muscle becomes tendinous, and blends in a common tendon of insertion, P, with the other two heads of the extensor.

The rectus is superficial except above, where it is covered by the sartorius, the iliacus, D, and the gluteus minimus, M. It conceals branches of the external circumflex artery, *e*, and anterior crural nerve, 2. Some of the fleshy fibres run from a central tendon to the sides, like the feather of a quill, producing the arrangement called penniform.

The *vastus externus*, L, or outer head of the extensor, arises from the upper half of the femur by a piece from half an inch to an inch thick, which is limited behind by the following points of the bone, viz., the outer part of the neck, the root of the great

trochanter, the line leading from the trochanter to the linea aspera, the upper half or more of the linea aspera; and it arises also from the contiguous external intermuscular septum.* For the most part tendinous above, it becomes fleshy lower down, and the fibres end inferiorly in the common tendon of insertion, some joining the rectus tendon and the patella.

The upper part of the muscle is overlaid by the rectus and tensor vaginae femoris. Beneath this vastus lie the inner vastus in part, and branches of the external circumflex artery and anterior crural nerve. Its lower tendon occupies the under surface, and extends upwards along the anterior or free edge of the muscle.

The *vastus internus*, F, constitutes the inner or large head of the extensor. It arises from the shaft of the femur except at the linea aspera and on the surfaces behind included by the lines prolonged from that ridge of bone to the trochanters in one direction and the condyles in the other.† Necessarily the fibres cannot be fixed where the outer vastus takes origin; and they are absent from the ends of the femur, for they reach upwards only to the anterior intertrochanteric line, and cease below near the articular surface of the knee-joint.

Most of the fleshy fibres are received on the superficial aponeurosis, which unites with the other heads in the common tendon of insertion, whilst some superficial fibres terminate on the tendon of the rectus and on the patella.

The upper part of the muscle is deeply placed beneath the rectus and sartorius, and vessels and nerves (Plate XLV.). Along the inner side lie the flexors and adductors of the hip-joint and the large blood vessels of the limb. Towards the knee the muscle

* The origin of the muscle here specified is that given by Cruveilhier and Theile, and is not so extensive as that assigned to it in English anatomical works: it resembles closely the attachment of the outer head of the triceps extensor brachii.

† This mass is described commonly as consisting of two muscles, vastus internus and crureus. Naturally there is not any separation between the two on the surface; and if a division is desired the mass is to be cut through longitudinally where the anterior and inner surfaces of the femur meet.

becomes prominent and makes a larger surface-swelling than the vastus externus on the outer side.

Common tendon of the extensor, P. Above the joint it is formed by the union of the tendons of the three heads; and it is continued over the knee-joint, diminishing in width, to be inserted into the tubercle of the tibia, and into an inch of the bone below: between the prominence of the tubercle and the tendon is a small bursa. Contained in the tendon is the patella, N, which completely divides it into an upper and a lower part:—The upper wide part intervenes between the fleshy fibres and the base of the patella; and the lower, narrower part, called oftentimes ligament of the patella, fixes the apex of that bone to the tibia. A very thin layer of tendinous fibres passes over the cutaneous surface of the patella.

An aponeurotic expansion, O, is prolonged from the upper part of the tendon over the patella and the knee-joint, and is fixed into the bones of the leg. On the knee it unites with the fascia lata, and with prolongations from the lateral flexors to form a capsule for the knee-joint.

Subcrureus. Under the extensor, on the lower fourth of the femur, lie some scattered fleshy fibres, arranged frequently in an outer and an inner fasciculus, which are inserted inferiorly into the synovial membrane of the knee-joint.

Action of the extensor. The use of the muscle will vary with the fixed or moveable condition of the bones of the limb to which it is attached. If the tibia is free to be moved all three heads will advance this bone on the articular surfaces of the femur, and so extend the knee-joint. Should the tibia be immoveable, as in rising from a stooping posture, or in walking, the femur and pelvis will be brought forwards over it. By the continued contraction of the muscles, after those bones are in a straight line, the body will be supported in standing by the action of the rectus on the pelvis, and of the two vasti on the femur.

The fibres of the subcrureus draw upwards the synovial membrane of the knee-joint as the tibia and femur come into a straight line in extension; and they are supposed to remove that membrane out of the way of pressure by the patella.

VESSELS OF THE FRONT OF THE THIGH.

The vessel supplying the extensor muscle of the knee is the external circumflex branch of the profunda artery, with its vein.

- | | |
|--|--|
| <ul style="list-style-type: none"> <i>a.</i> Femoral artery. <i>b.</i> Circumflex iliac artery. <i>c.</i> Epigastric artery. <i>d.</i> Profunda artery. <i>e.</i> External circumflex artery. | <ul style="list-style-type: none"> <i>f.</i> Ascending branch of circumflex. <i>g.</i> Descending branch. <i>h.</i> Transverse branch. <i>i.</i> Femoral vein. |
|--|--|

The *profunda artery*, *d*, runs beneath the femoral trunk, and distributes large branches in the thigh: of these the only one included in this Illustration is the external circumflex.

The *external circumflex artery*, *e*, is the largest branch of the profunda, and springs near the beginning of that trunk: destined for the outer part of the thigh, it divides into three chief pieces amongst the branches of the anterior crural nerve.

The ascending branch, *f*, passes under the sartorius, rectus, and tensor vaginæ femoris to the back of the hip-bone, where it supplies the gluteal muscles, and anastomoses with the gluteal artery: it furnishes nutritive branches to the muscles amongst which it passes.

The descending branch, *g*, is the largest of the three pieces, and divides into offsets which enter the deep heads of the extensor. One offset courses over the surface of the vastus externus to the knee-joint with a small nerve.

The transverse branch, *h*, divided into two or more offsets, enters beneath the vastus externus, and piercing that muscle anastomoses with the arteries on the back of the thigh.

The *external circumflex vein* (Plate XLV. *o*) has the same general distribution as the artery, and joins the profunda vein.

NERVES OF THE FRONT OF THE THIGH.

Two nerves, viz. a branch of the gluteal, and the anterior crural, are supplied to the muscles described in this Plate.

- | | |
|--|--|
| <ul style="list-style-type: none"> 1. Nerve to tensor vaginæ femoris. 2. Anterior crural nerve. 3. Branches to sartorius and rectus,
cut. 4. Nerve to vastus externus. | <ul style="list-style-type: none"> 5. Upper nerve to vastus internus. 6. Lower nerve to vastus internus. 7. Internal saphenous. 8. Nerve to the pectineus. |
|--|--|

Ending of superior gluteal nerve, 1. This gluteal nerve is distributed nearly altogether to the two smaller gluteal muscles, and it ends anteriorly, as here seen, in the tensor of the fascia lata. A branch of the gluteal artery accompanies the nerve.

Anterior crural nerve, 2. The deep or muscular branches of this nerve are furnished to the triceps extensor, the sartorius, and to one other muscle, the pectineus.

Branches to rectus and sartorius, 3, 3. Each enters its muscle at the upper part; they were cut when the muscles were removed.

Branch to the vastus externus, 4. This is a large nerve, which enters the muscle above the middle: from it a slender articular offset is prolonged on the surface of the vastus, with a superficial artery, to the capsule of the knee-joint, which it pierces.

The branches to the vastus internus are two in number. The upper one, 5, is supplied to the fleshy fibres of that part sometimes named crureus; and the lower branch, 6, which is figured in the preceding Plate, belongs to the inner part of the vastus internus and to the inner side of the knee-joint.

Nerve to the pectineus, 8. This branch separates from the trunk of the anterior crural near Poupart's ligament, and passes beneath the femoral vessels to enter the pectineus on the superficial surface. Oftentimes there are two nerves instead of one.

DESCRIPTION OF PLATE XLVII.

IN this Illustration the dissection of the deeper adductor muscles, with the profunda artery and obturator nerve, is exhibited.

The superficial adductors having been laid bare as in Plate XLV., the pectineus and adductor longus are to be cut through; and after removing the greater part of each of those muscles, the deeper adductors, and the ramifications of the profunda artery and obturator nerve are to be cleaned.

ADDUCTOR MUSCLES OF THE HIP-JOINT.

This group of muscles occupies the space between the pelvis and the femur, and consists of three adductors, with the pectineus and gracilis: two of the muscles, viz. pectineus and adductor longus, are represented in Plate XLV.

- A. Sartorius.
- B. Psoas muscle.
- C. Tensor vaginæ femoris.
- D. Iliacus.
- E. Rectus femoris, cut.
- F. Vastus internus.
- G. Pectineus, cut.
- H. Adductor longus, cut.

- I. Gracilis.
- J. Adductor magnus.
- K. Adductor brevis.
- L. Vastus externus.
- M. Semi-membranosus.
- N. Obturator externus.
- O. Semi-tendinosus.
- P. Internal lateral ligament of knee.

position.
attachment.

The *pectineus* (G, Plate XLV.) is the smallest and highest of the muscles in the adductor group. It has a fleshy origin from the ilio-pectineal line of the hip-bone, and from the smooth triangular surface in front of that line; its fibres descend and are inserted by means of a thin tendon, about two inches wide, behind the small trochanter of the femur, and into the upper part of the line leading from that prominence to the linea aspera.

Relations.

The muscle is in contact with the fascia, and forms part of the inner boundary of Scarpa's space. Beneath it lie the obturator and adductor brevis muscles, with part of the obturator nerve. Along the upper border is placed the psoas with the external circumflex vessels; and along the lower is the adductor longus.

Action. - The pectineus will adduct and raise the femur if this bone is not fixed; and it will take part with the rest of its group in projecting forwards the thigh in walking. When the femur is immovable, as in standing, it will assist in balancing, or drawing forwards the pelvis.

position.
attachment.

The *adductor longus* (H, Plate XLV.) is situated on the same level as the pectineus, but between this and the gracilis: it is narrow at its origin from the pelvis, but becomes wider below. Its upper tendon, about as large as the end of the finger, is fixed to the front of the pubic part of the hip-bone, just below the angle formed by the symphysis and the pubic crest; and the lower tendinous end is inserted into the inner lip of the linea aspera.

Partly subfascial, this adductor is covered near the femur by the sartorius and the femoral vessels : by the opposite surface it touches the adductor brevis and magnus, and the profunda vessels and part of the obturator nerve. *Relations*

The muscle assists in bringing forwards the femur in walking ; and carrying that bone towards its fellow, it will be chiefly instrumental in crossing the thighs. If the femur is fixed, as in standing, the muscle balances with others the pelvis on the limb. *actions*

The *gracilis*, I, is a thin tapering muscle, which reaches from the pelvis to the tibia. It arises by a thin tendon, from two and a half to three inches deep, along the lower border of the hip-bone, and reaches upwards half way along the symphysis. At the lower third of the thigh it ends in a rounded tendon, and is inserted into the inner surface of the tibia, beneath the sartorius, A, but nearer the knee than the semi-tendinosus, O, which it resembles in size and form. *Position*
attachment

The muscle is superficial, and its connections are better illustrated in Plate XLIV. It lies against the adductor brevis and magnus as far as the lower third of the thigh, and thence against the semi-membranosus as it bounds internally the popliteal space. Near its insertion it is placed on the internal lateral ligament of the knee-joint, a bursa intervening ; and gives an expansion to join the fascia of the leg. *Relation*

With the limb free to move the gracilis will draw the femur towards the other thigh, especially after abduction of it. If the tibia is free to move the muscle will bend and rotate inwards the knee-joint ; and when the tibia is fixed the muscle will act on the pelvis, like the rest of the group. *actus*

Adductor brevis, K. Deeper placed than the muscles before described, it arises beneath the adductor longus from the fore part of the os innominatum, where it is attached outside the gracilis for a distance of two inches. The muscle widens below, and is inserted into the femur behind the pectineus, and into the line prolonged from the linea aspera. *Position*
attachment

It is concealed above by the pectineus and adductor longus, but as these separate from each other below they leave a large part of the muscle uncovered : near its origin it is crossed by the *Relation*

superficial part of the obturator nerve, and at its insertion by the profunda vessels. The posterior surface rests on the adductor magnus, and on the deep piece of the obturator nerve and the accompanying vessels. Its upper border touches the obturator and psoas muscles, and the internal circumflex vessels.

Actus Its action is similar to that of the pectineus and adductor longus; for it engages in adduction of the femur; in the projection forwards of that bone in walking; and in supporting the pelvis in standing.

Psoas
attaches to. The *adductor magnus*, J, is the largest muscle in the group of adductors, and is wide and fleshy above, but narrow and tendinous below. It takes origin along the lower border of the hip-bone between the symphysis and the ischial tuberosity. From the pelvis the fibres diverge to a wide insertion into the femur, after this manner:—The anterior and upper fibres are fixed to the line continued from the great trochanter to the linea aspera, to the linea aspera itself, and for about an inch to the ridge leading from that crest of bone to the inner condyle; whilst the hinder and lower fibres end in a strong tendon, and are attached by it to the inner condyle and the inner condyloid ridge.

Relatus — This large adductor forms a triangular partition between the other adductor muscles and the hamstrings. Its upper border touches the obturator externus, and the lower is overlaid by the gracilis and sartorius. Near the femur the profunda vessels lie on it; and the muscle, united with the other adductors, is pierced by the perforating branches of those vessels. At the lower third of the thigh the adductor transmits the femoral artery through an aperture, Q, which is tendinous on the anterior and fleshy on the posterior surface.

Actus — This muscle acts powerfully as an adductor of the thigh, especially if the limb is in a state of abduction, as in riding. When the limb is behind the trunk in walking the great adductor will bring it forwards; but it does not flex the hip-joint, like the other adductors. In standing it will prop the pelvis with its companions.

Psoas — *Psoas and iliacus.* These muscles are separate at their origin in the abdomen (p. 296), but are united near their attachment to

the femur. The psoas, B, becomes tendinous below, and is attached inserted into the small trochanter of the femur. The iliacus, D, joins by some fleshy fibres the outer part of the psoas tendon, but the rest are continued to the femur, and are inserted into a special surface in front of, and below the small trochanter.

The two muscles cover the hip-joint, and the front of the hip-relates bone between the iliac crest and the ilio-pubic eminence : a large bursa separates the psoas from the joint ; and a smaller one intervenes between the iliacus and the anterior margin of the bone. On the psoas lies the femoral artery ; and between the two muscles the anterior crural nerve is imbedded. Internally are placed the adductor muscles with the internal circumflex vessels ; and externally, are the extensor of the knee-joint, and branches of the external circumflex vessels.

These muscles flex the hip-joint, and advance the femur in action front of the trunk in making a step. After the joint is flexed, they bring forward the small trochanter, and so rotate out the femur : their action on the spinal column is given before in p. 296.

Obturator externus, N. The origin of the muscle appears with attachment the adductors, and the insertion with the muscles of the buttock. It arises from the outer surface of the anterior half of the obturator membrane, and from the contiguous part of the hip-bone ; and its tendon, which is directed backwards below the hip-joint, is inserted into the pit at the root of the great trochanter.

The muscle acts as an external rotator when the femur hangs and is free to move ; but its fuller action on that bone and the pelvis will be detailed more specially with the anatomy of the external rotators.

PROFUNDA VESSELS OF THE THIGH.

The large profunda artery is the chief nutritive vessel of the thigh ; and it maintains anastomoses with arteries of the buttock and leg when the femoral trunk has been rendered impervious to the blood by ligature or other cause.

- | | |
|--|--|
| <p><i>a.</i> Femoral artery.
 <i>b.</i> Circumflex iliac branch.
 <i>c.</i> Epigastric branch.
 <i>d.</i> Profunda, or deep femoral.
 <i>e.</i> External circumflex branch.
 <i>f.</i> Internal circumflex branch.
 <i>g.</i> Muscular branch of circumflex.</p> | <p><i>h.</i> First perforating artery.
 <i>i.</i> Second perforating.
 <i>j.</i> Third perforating.
 <i>k.</i> Continuation of profunda, or fourth perforating.
 <i>l.</i> Anastomotic branch.</p> |
|--|--|

origin.—The *profunda artery, d*, arises from the femoral trunk about one inch and a half below Poupart's ligament; and it is called sometimes deep femoral from its position to the parent trunk.

course.—It courses on the inner side of the femur parallel to, but beneath the femoral trunk, as far as the lower third of the thigh, where a fine branch continues it onwards to the back of the limb. It has the following connections with muscles:—At first it rests on the iliacus, and appears external to the femoral artery in Scarpa's triangular space; then it is directed down and in under the femoral vessels, lying over the pectineus and adductor brevis; finally it enters beneath the adductor longus, and ends in a small perforating branch to the back of the thigh. Its named offsets are two circumflex, and four perforating; but it furnishes also large unnamed muscular and anastomotic branches.

Branches.—

Circumflex branches. Two in number, they wind backwards, one inside and the other outside the femur, like the corresponding arteries in the upper limb, and communicate at the back of the thigh.

The *external circumflex, e*, is consumed chiefly in the extensor muscle of the knee-joint (p. 370), and its ramifications are displayed in Plates XLVI. and LII.

The *internal circumflex, f*, bends back between the psoas, B, on the one side, and the pectineus and adductor brevis, G and K, on the other, and divides opposite the small trochanter into two terminal pieces—an ascending to the buttock, and a transverse to the back of the thigh (Plate L.).

In this course it furnishes an articular branch to the hip-joint, and muscular offsets to the obturator externus and the adductors: the largest of these, *g*, passes beneath the adductor brevis, supplying it and the adductor magnus, and accompanies the deep part of the obturator nerve.

Perforating arteries. Four in number, they pierce the aponeuroses of the adductor muscles, close to the femur, and are named first, second, &c. After reaching the back of the thigh they supply muscular offsets to the biceps, and then turn round the femur on the outside to end in the vastus externus. See Plate LII.

The *first perforating*, *h*, arises opposite the lower border of the pectineus muscle, and perforates the adductors brevis and magnus.

The *second perforating*, *i*, leaves the trunk half way down the adductor brevis, and passes through the same adductors as the preceding branch: it gives an offset to the shaft of the femur.

The *third perforating*, *j*, springs from the profunda at the lower border of the adductor brevis, and is transmitted through the adductor magnus to its destination.

The continuation of the profunda or the *fourth perforating*, *k*, pierces the great adductor muscle near the opening for the femoral artery.

Muscular branches of the profunda enter the adductors; but the largest, three or four in number, pass through the adductor magnus to end in the hamstring muscles behind, where they maintain a chain of anastomoses at the back of the thigh (Plate LII.).

The *profunda vein* accompanies the artery of the same name, and ends above in the femoral vein. In this course it is superficial to its artery, and is situate between the trunks of the femoral and profunda arteries.

NERVES OF THE FRONT OF THE THIGH.

Two nerves are included in this dissection, viz. the anterior crural, and the obturator; the first nerve and its branches are marked by the same numbers as in the preceding Figure.

- | | |
|--|------------------------------------|
| 1. Anterior and middle cutaneous
of the thigh, cut. | 3. Nerve of the rectus, cut. |
| 2. Trunk of the anterior crural. | 4. Nerve to the vastus externus. |
| | 5. Upper nerve to vastus internus. |

- | | |
|--|--|
| 6. Lower nerve to vastus internus. | 12. Piece to join the internal cutaneous. |
| 7. Internal saphenous nerve. | 13. Deep part of the obturator. |
| 8. Patellar branch of saphenous. | 14. Articular branch of the obturator to the knee-joint. |
| 9. Accessory obturator nerve. | |
| 10. Superficial part of the obturator. | |
| 11. Piece to the femoral artery. | |

Anterior crural nerve, 2. The view of the nerve in this Plate is very similar to that in the preceding Figure : its description has been given at p. 264.

The *obturator nerve* ramifies amongst the adductor muscles. Beginning in the lumbar plexus (p. 309), it leaves the pelvis through the aperture in the upper part of the thyroid foramen, and divides into two pieces, superficial and deep, as it escapes from the cavity. It is especially the nerve of the adductors, for it supplies all the muscles of the group except the pectineus ; and it furnishes offsets also to one external rotator of the hip, viz. the obturator externus.

The *superficial part, 10*, ends on the femoral artery ; and it is directed to its vessel over the adductor brevis, but beneath the pectineus and adductor longus.* It furnishes branches to the adductor brevis and longus, and to the gracilis ; and it communicates by the offset, 12, with the internal cutaneous branch of the anterior crural nerve.

Before this part of the obturator nerve reaches the thigh it gives an articular branch to the hip-joint ; and beneath the pectineus it is joined (sometimes) by a communicating offset of the accessory obturator nerve, 9.

The *deep part* of the nerve, 13, pierces the fibres of the external obturator muscle and is continued into the thigh beneath the adductor brevis, furnishing branches to this muscle and the adductor magnus ; and from the ending a long slender articular filament is continued through the adductor magnus, near the opening for the femoral vessels, to supply the popliteal artery

* In the Figure the nerve appears to cross over the ad. longus, but this is occasioned by the muscle being cut, and the nerve being displaced ; its natural position to that muscle is given in Plate XLV.

and the knee-joint (Plate LII.). From the deep part of the nerve branches are supplied to the external obturator muscle.

The *accessory obturator nerve*, 9, is a small branch of the lumbar plexus, which is but rarely present. It courses from the abdomen over the front of the hip-bone, lying close inside the psoas muscle; it then bends outwards under the pectineus, where it joins the superficial part of the obturator nerve, and supplies the hip-joint. When it is large it furnishes occasionally a branch to the pectineus.

DESCRIPTION OF PLATE XLVIII.

IN this Illustration the gluteus maximus may be observed in its natural position, together with the nerves and vessels superficial to it.

The skin having been reflected, as in the Figure, the cutaneous nerves and vessels will be found in the fat in the positions indicated in the Plate. After the examination of the cutaneous nerves and vessels the gluteus may be cleaned by beginning at the upper border in the right limb, and at the lower border in the left limb.

CUTANEOUS NERVES AND VESSELS OF THE BUTTOCK.

The cutaneous nerves of the buttock are derived from many sources, and come from both the anterior and posterior primary trunks of the spinal nerves. Small superficial vessels accompany the nerves.

- | | |
|---|---|
| <p>1. Lateral cutaneous of the last dorsal nerve.</p> <p>1'. Iliac branch of ilio-hypogastric.</p> <p>2. Lumbar nerves (posterior primary trunks).</p> <p>3. Sacral nerves (posterior primary trunks).</p> <p>4. Sacral nerves (anterior primary trunks).</p> <p>5. Perinæal branch of the 4th sacral (perforating)</p> | <p>(anterior primary trunk).</p> <p>6. Recurrent cutaneous of small sciatic.</p> <p>7. Hæmorrhoidal branch of the pudic.</p> <p>8. Inferior pudendal of the small sciatic.</p> <p>9. Cutaneous to the thigh of the small sciatic.</p> <p>10. Small sciatic nerve.</p> |
|---|---|

The *lateral cutaneous* of the *last dorsal* nerve, 1, descends from the abdominal wall over the fore part of the iliac crest, and continues in the fat as far as the great trochanter.

The *iliac branch*, 1', of the *ilio-hypogastric nerve* (p. 309) crosses the iliac crest close to the bone, and commonly behind the last dorsal: it extends to the fat over the great gluteal muscle. This nerve is sometimes large, and takes the place of the last dorsal; or it may be wanting.

Posterior lumbar nerves, 2. Cutaneous branches of the posterior primary trunks of the lumbar nerves, commonly two in number, enter the teguments at the anterior border of the erector spinæ muscle, and are directed downwards over the gluteus towards the great trochanter.

Posterior sacral nerves, 3. The posterior primary trunks of the first three sacral nerves pierce the fibres of the gluteus maximus, after uniting beneath it (Plate L.). Two or three become cutaneous, and bend outwards over the gluteus; the largest is opposite the end of the sacrum.

Anterior sacral nerves, 4. Branches of the anterior primary trunks of the sacral nerves pierce the coccygeus and gluteus maximus, and end in the neighbouring integuments.

Two other small nerves of the perinæum issue beneath the lower edge of the gluteus. One is the *perineal branch*, 5, of the fourth sacral nerve—and the other is the *inferior hæmorrhoidal nerve*, 7, of the pudic. Both of these have been noticed in page 247.

The *small sciatic nerve*, 10, of the sacral plexus appears at the lower border of the great gluteal muscle, and is then continued along the thigh (Plate LII.). Near the lower border of the muscle it gives two sets of cutaneous branches—ascending and descending.

The ascending or recurrent set, which are marked with 6, wind over the edge of the gluteus, and end in the integuments over the lower part of that muscle.

The descending set, shown by the number 9, supply the integuments of the inner part of the thigh below the buttock. One of these, 8, which is larger than the rest, is distributed to the

integuments of the scrotum or the labium, according to the sex (p. 254), and is named *inferior pudendal*.

The *external cutaneous* of the thigh, a branch of the lumbar plexus (p. 309), furnishes offsets to the fore part of the region laid bare.

The *cutaneous vessels*, like the nerves, are derived from several sources. Accompanying the last dorsal nerve, 1, is a branch of the lowest intercostal artery; and running with the ilio-hypogastric, 1', is a small branch of a lumbar artery. With the lumbar nerves, 2, are offsets of the posterior branches of the lumbar arteries; and with the sacral nerves, 3 and 4, are branches of the sciatic artery. The offsets of the small sciatic nerve, 10, have, as their companions, ramifications of the sciatic artery. Through the upper part of the gluteus branches of the gluteal artery penetrate; and through the lower part, the branches of the sciatic artery. At the upper border of the gluteus appear offsets also of the gluteal artery; and small branches of the external circumflex of the profunda perforate the fascia lata over the great trochanter.

MUSCLES OF THE BUTTOCK.

Only the great gluteal muscle is dissected in this stage, though two other glutei cover the hip-bone; and one, the gluteus medius, shows through the fascia in the Plate. Issuing beneath the gluteus maximus are the hamstring muscles of the thigh.

A. Gluteus maximus.	D. Biceps flexor cruris.
B. Gluteus medius, covered by fascia.	E. Semitendinosus.
C. Fascia lata of the thigh.	F. Semimembranosus.
	G. Adductor magnus.

The *gluteus maximus*, A, reaches from the pelvis to the femur, and resembles the deltoid muscle of the upper limb in its position, and in the coarseness of its fibres.

The pelvic attachment, or the origin, is fixed, from above down, to the posterior third of the crest and the contiguous part of the hip-bone, to the tendon of the multifidus spinæ, to the last piece of the sacrum, and to the side of the coccyx and the great sacro-

sciatic ligament. From this attachment the coarse bundles of fibres are directed downwards and outwards, and becoming tendinous are inserted into the fascia lata and the femur—about the upper two thirds joining the fascia, and the rest the bone. The precise insertion is made evident in Plate LII., where the muscle is partly cut through and reflected.

This gluteus is covered by the fascia lata and teguments ; and it is in contact by the deep surface with the parts displayed in Plate XLIX. Its upper border, the shortest, is crossed by cutaneous vessels and nerves, and rests on the gluteus medius ; whilst the lower border forms part of the ischio-rectal fossa, and lies over the adductor magnus and the hamstring muscles. Round the lower border wind branches of the small sciatic nerve with their accompanying vessels.

If the femur is immoveable the muscles of both sides will assist in balancing the pelvis on the thigh-bones, as in standing ; and if the pelvis is bent forwards, as in stooping to the ground, the large glutei will act powerfully in bringing the trunk into the erect position. In rising from the sitting to the upright posture, these muscles are chiefly active, becoming extensors of the hip-joints. In standing on one leg, say the right, the trunk will be rotated on its bony prop, so as to have the face turned to the left side.

If the thigh-bone is free to move, the muscle will rotate out the femur, and will then abduct, and carry back that bone so as to extend the hip-joint.

DESCRIPTION OF PLATE XLIX.

THE second stage of the Dissection of the buttock is depicted in this Figure.

The view here given may be obtained by cutting vertically through the gluteus maximus near the pelvic attachment, and removing carefully all the fat from the underlying muscles, vessels,

and nerves. On the fore part of the gluteus medius the fascia lata has been left.

MUSCLES OF THE BUTTOCK.

Two groups of muscles occupy the back of the pelvis, viz. the glutei or abductors of the hip, and the external rotators of the same joint.

A. Gluteus maximus, cut.
B. Gluteus medius.
C. Piriformis.
D. Gluteus minimus.
E. Gemellus superior.
F. Obturator internus.
G. Gemellus inferior.
H. Obturator externus.
I. Quadratus femoris.

J. Adductor magnus.
L. Semitendinosus.
N. Biceps cruris.
O. Semimembranosus.
P. Vastus externus.
Q. Tensor vaginæ femoris.
R. Great sacro-sciatic ligament.
S. Fascia lata on the gluteus.

The *gluteus medius*, B, is placed farther forwards than the *gluteus maximus*, and the fibres converge to the top of the trochanter. It arises from the outer surface of the os innominatum between the crest and the upper curved line, except behind where the *gluteus maximus* is attached, extending nearly to the hinder border of the bone; and the superficial fibres are attached to the fascia lata. The muscle is inserted below across the outer surface of the great trochanter from the tip to the root.

The muscle is in part subcutaneous, and is in part covered by the *gluteus maximus*. Its anterior border touches the tensor fasciæ latæ, Q; and the hinder border, which is contiguous to the *piriformis*, near the pelvis, overlays this muscle near the femur. Between it and the *piriformis* are seen the superficial part of the gluteal artery, and the superior gluteal nerve.

The action of the muscle will vary with the state of the bones as to fixedness or mobility.

Should the femur be free to be moved the muscle will abduct it from its fellow. If the bone is hanging the anterior and lower fibres will rotate it inwards. In the beginning of a step in walking the fore part of the muscle acts with the smallest *gluteus* in bringing forwards the hinder limb until it comes into a line with the trunk.

When both legs are fixed, as in standing, this and the small gluteus will aid in balancing the pelvis on the thigh bones. When the body is propped on one leg the two smaller gluteal muscles act powerfully in keeping the hip-bone fixed ; and in walking the same glutei muscles assist in balancing the trunk over the supporting limb. The anterior fibres alone acting will turn the face to the same side.

The *gluteus minimus*, D, is covered by the preceding, and is attached to the pelvis and the thigh bone, like the medius ; it resembles this muscle in its action, and it will be described with the following Plate.

External rotators of the hip-joint. This group consists of six muscles, viz. pyriformis, obturator internus and gemelli, quadratus femoris, and obturator externus. All are placed at the back of the joint, and are directed almost transversely from the pelvis to the top of the femur.

The *pyriformis*, C, arises inside the pelvis from the front of the sacrum (p. 313) ; and as it issues from that cavity by the great sacro-sciatic notch it has a further fleshy attachment to the edge of the hip-bone, and to the great sacro-sciatic ligament, R. Outside the pelvis the muscle is inserted by a narrow tendon into the top of the great trochanter between the two smaller glutei.

The part of the muscle in the buttock is concealed by the gluteus maximus, and by the gluteus medius in part ; and rests on the gluteus minimus, which separates it from the hip-joint. The upper edge lies along the gluteus medius, and the lower is near the upper gemellus, E. As it escapes from the pelvis it divides into two the great sacro-sciatic notch : through the upper part issue the gluteal vessels, and the upper gluteal nerve ; and through the lower come the sciatic and pudic vessels and nerves.

Should the thigh-bone hang loosely the muscle will draw backwards the great trochanter, and give rise to rotation outwards ; but should the hip-joint be bent it will abduct the femur from the other limb. Supposing the limb fixed, as in standing, the pyriformis will help to balance the pelvis ; and in rising from a stooping posture it will assist in erecting the trunk. In standing

on one leg, say the right, it will rotate the trunk, turning the face to the opposite side.

The *obturator internus*, F, arises inside the pelvis, like the *pyriformis*, and is attached to nearly the whole inner surface of the obturator membrane, and to the greater part of the inner surface of the hip-bone behind the thyroid hole. The muscle appears through the small sacro-sciatic notch, and passes over the back of the hip-joint to be inserted into the great trochanter, in front of the *pyriformis*, and into the contiguous part of the neck of the femur.

Outside the pelvis the small *gemelli* muscles lie along the sides of the obturator ; the whole is covered by the *gluteus maximus*, and is crossed by the sciatic vessels and nerves : underneath is the capsule of the hip-joint—a bursa intervening. In the sacro-sciatic notch the pudic vessels with nerves lie on the muscle ; and the under surface, which is tendinous and divided into pieces as it rests on the bone, is lubricated by a synovial membrane.

This muscle being almost parallel to the *pyriformis* its action is similar on the pendent and elevated femur ; and on the pelvis when supported on both legs or on one. During walking it and the other members of its group assist the *gluteus medius* and *minimus* in fixing the pelvis on the supporting limb ; and when the limb is swung forwards it and the other rotators will keep the foot straight.

The *gemellus superior*, E, arises from the outer and lower part of the ischial spine, and is inserted with the *obturator internus* which it joins. The muscle lies above the *obturator internus*, and is smaller than its fellow : it is often absent.

The *gemellus inferior*, G, is in contact with the lower border of the *obturator internus*, and is much larger than the upper *gemellus*. It arises from the lower edge of the groove in the hip-bone for the *obturator internus* ; and it is inserted into the trochanter of the femur with the *obturator* muscle.

These muscles have the same connections as the extra-pelvic part of the *obturator internus*, to which they seem to be accessory heads of attachment. The upper intervenes between the *obturator* and the *pyriformis* and *gluteus minimus*, and the lower

separates the obturator from the quadratus femoris and obturator externus. Near the pelvis the edges are applied together to form a kind of groove which contains the obturator, but near the femur they cover the tendon of that muscle.

They act on the thigh-bone like the obturator internus, rotating out when the limb is hanging, and abducting when the femur is bent on the trunk. In standing on both legs, on one leg, and in walking, they will also assist the obturator though their power will be but small.

The *obturator externus*, H, appears as a tendon between the inferior gemellus and quadratus femoris. Its origin opposite the obturator internus from the outer part of the membrane of the same name, and in part from the pelvis, is indicated in Plate XLVII. ; and the buttock part of the muscle will be illustrated in the next Plate.

The *quadratus femoris*, I, is thin and fleshy, and arises from the outer border of the tuber ischii, external to the semimembranosus and the adductor magnus. Its fibres form a squarish layer, from two to three inches wide, which is inserted into a tubercle in the posterior inter-trochanteric line, and vertically into the upper end of the femur for two inches : the line of attachment is sometimes called *linea quadrati*.

Covered by the same parts as the other rotators, it is also concealed at its origin by the hamstring muscles. Underneath it is the obturator externus with the hip-joint. By the upper border it touches the inferior gemellus and obturator externus ; and by the lower it is in contact with the adductor magnus—a piece of the internal circumflex artery with its veins issuing between the two.

This muscle will assist, though but feebly, the pyriformis and obturators in rotating out the hanging limb ; in abducting the bent limb ; in balancing the pelvis in standing on both legs, or on one ; and in rotating the face to the opposite side when the trunk is supported on one leg.

Hamstrings and adductor magnus. The upper ends of the three flexors of the knee-joint (hamstrings) are laid bare at their attachment to the ischial tuberosity : they consist of semitendi-

nosus, L, biceps, N, and semimembranosus, O, and they are more fully seen in Plate LII.

Parts of the origin and insertion of the adductor magnus, which were not visible in the former view of the muscle (Plate XLVII.), are now denuded. Internal to the hamstrings may be seen the origin from the ischial tuberosity; and external to those muscles is the wide expanded part, which is inserted into the femur in a line with the quadratus femoris, and in the attachment side of the gluteus maximus.

ARTERIES OF THE BUTTOCK.

Most of the arteries of the buttock belong to the set of external parietal branches of the internal iliac (p. 306): they are the gluteal, sciatic, and pudic, which issue from the pelvis by the great sacro-sciatic notch. Branches of the profunda artery appear also in the lower part of the region dissected.

a. Superficial part of the gluteal artery.	of the sciatic.
b. Pudic artery.	f. Continuation of the sciatic.
c. Trunk of the sciatic.	g. Branch to great sciatic nerve.
d. Coccygeal branch of the sciatic.	h. Branch of internal circumflex.
e. Muscular and anastomotic branch	i. Ending of first perforating artery.

The *gluteal artery* comes through the great sacro-sciatic notch above the pyriformis, and supplies the gluteal muscles. It divides at once into a superficial and a deep piece, and the latter of these will be contained in the next Plate.

The superficial part *a*, sends off many branches to the under surface of the gluteus maximus. One or two small branches run inwards and backwards through the great sacro-sciatic ligament to the integuments, and send deeper offsets to the muscle over the back of the sacrum.

The *pudic artery*, *b*, appears in the buttock for a very short distance: it leaves the pelvis through the great sacro-sciatic notch, below the pyriformis, and then winds over the ischial spine by the side of the nerve of the same name, to enter the perinæum through the small sacro-sciatic notch.

The *sciatic artery, c*, escapes with the pudic and sciatic vessels and nerves through the great sacro-sciatic notch, and is accompanied by cutaneous offsets of the small sciatic nerve. It supplies the part of the buttock below the gluteal artery, and furnishes the following branches :—

The *coccygeal branch, d*, pierces the great sacro-sciatic ligament, and supplies the gluteus maximus : one of its branches enters that muscle, and accompanies the chief cutaneous offset of the sacral nerves ; whilst others ramify on the back of the sacrum and coccyx.

Muscular and anastomotic branch, e. This artery varies much in size, and passes transversely outwards to the root of the great trochanter. It supplies largely the gluteus maximus, and ends at the spot mentioned by anastomosing with the gluteal and internal circumflex arteries.

Nerve branches. A small artery, *g*, enters the trunk of the great sciatic nerve, and is called “comes nervi ischiadici.” And the continuation of the artery, *f*, accompanies the smaller sciatic nerve, branching like it to be distributed with the several offsets of the nerve.

Muscular branches, many of which were cut in the dissection, enter the under surface of the great gluteus, and the lower external rotator muscles ; and the artery to the quadratus femoris runs to its muscle with the nerve, 5 beneath the gemelli and internal obturator.

The *internal circumflex artery* of the profunda (Plate L.) divides into two beneath the quadratus : the branch, *h*, to the thigh issues between the contiguous borders of the quadratus and adductor magnus, and is distributed to the hamstrings.

First perforating artery. This branch of the profunda pierces the adductor magnus, and supplying the gluteus maximus and the biceps muscle, *N*, ends in the vastus externus.

NERVES OF THE BUTTOCK.

Most of the nerves included in this dissection are branches of the sacral plexus, and appear at the lower border of the pyri-

formis, where the plexus ends: they may be arranged into branches to the limb, to the perinæum, and to some external rotator muscles. By the side of the gluteal artery is the superior gluteal nerve, which is not derived from the plexus; and on the great sacro-sciatic ligament lies a branch of the sacral nerves.

- | | |
|---|---|
| <ol style="list-style-type: none"> 1. Cutaneous branch of the sacral nerves. 2. Pudic nerve. 3. Nerve to the obturator internus. 4. Branch to the upper gemellus. 5. Branch to the quadratus femoris. 6. Upper branches to the gluteus maximus. 7. Small sciatic nerve. 8. Lower branches to the gluteus maximus. | <ol style="list-style-type: none"> 9. Inferior pudendal nerve. 10. Cutaneous of the buttock and inner part of the thigh. 11. Great sciatic nerve. 12. Muscular branch of the great sciatic. 13. Superior gluteal nerve. 14. Iliac branch of ilio-hypogastric. †† Cutaneous of the posterior trunks of the lumbar nerves. |
|---|---|

The *small sciatic nerve*, 7, is chiefly a cutaneous nerve of the buttock, scrotum, and back of the limb, for only one muscle (*gluteus maximus*) receives branches from it. It begins by two or more pieces in the lower part of the sacral plexus, and takes the course of the sciatic artery over some of the external rotators, as far as the lower border of the *gluteus maximus*: here the nerve furnishes many branches (Plate XLVIII.), and is continued beneath the fascia of the thigh with a branch of artery to the integuments of the calf of the leg. Its offsets are these:—

Muscular or *gluteal* branches, 8, enter the lower part of the *gluteus maximus*: they are called inferior gluteal, to distinguish them from the branches of the superior gluteal nerve, for the smaller glutei muscles.

The *inferior pudendal*, 9, winds beneath the fascia lata, and below the ischial tuberosity, near which it becomes cutaneous to end in the scrotum or the labium (Plate XXXI.).

Cutaneous branches of the buttock and thigh, 10. The branches of the buttock run backwards over the *gluteus maximus*, and are better shown in Plate XLVIII. The thigh-branches are inclined downwards and inwards, and piercing the fascia lata, end in the integuments of the upper third of the thigh on the inner aspect.

The *great sciatic*, 11, is the largest nerve in the body; and in it the sacral plexus terminates. In its course to the back of the thigh it is placed in the hollow between the great trochanter and the ischial tuberosity, lying on the external rotators below the pyriformis; and it is concealed by the gluteus maximus till it reaches the hamstrings. As the nerve is about to leave the region of the buttock a branch for the hamstring muscles is detached from it, whose distribution will appear in Plate LII.

The *pudic nerve*, 2, turns over the small sacro-sciatic ligament by the side of the artery of the same name, and gains the perinæal space through the small sacro-sciatic notch. Its further progress is given in the Plates of the perinæum.

Muscular branches of the sacral plexus supply the gluteus maximus, and all the external rotators except the obturator externus.

The branches to the gluteus, 6, have been cut across as they pierce the muscular fibres: these are known as inferior gluteal, like the branches of the small sciatic to the same muscle, and penetrate the upper fleshy fibres.

The branch to the obturator internus, 3, with its artery, accompanies the pudic vessels through the small sacro-sciatic notch, and soon sinks into the fleshy fibres.

The branch to the upper gemellus, 4, is sometimes very fine; a considerable difference in its size is manifest in the following Plate which was drawn from another body.

The branch to the inferior gemellus and quadratus, 5, is a slender nerve, which runs with a small artery beneath the gemelli and obturator internus.

DESCRIPTION OF PLATE L.

IN this Figure the third stage in the dissection of the buttock is represented.

Supposing the second stage of the dissection to have been car-

ried out as in the preceding Plate, the third stage will be arrived at by removing the gluteus medius, and by cutting through and reflecting the obturator internus and quadratus femoris. On taking away a superficial stratum of the great sacro-sciatic ligament the sacral nerves will come into sight.

The small sciatic nerve and the sciatic artery were cut away, and all the veins were removed with the view of rendering the connections less complicated.

DEEP MUSCLES OF THE BUTTOCK.

Two muscles, the gluteus minimus and obturator externus, come under notice for the first time ; but most of the others have been demonstrated in the preceding Plate, though some points in their anatomy receive here further illustration.

- | | |
|---------------------------------------|----------------------------------|
| A. Cut ends of the gluteus maximus. | J. Obturator externus. |
| B. Insertion of the gluteus medius. | K. Insertion of psoas magnus. |
| C. Gluteus minimus. | L. Insertion of adductor magnus. |
| D. Tensor vaginæ femoris. | N. Vastus externus. |
| E. Piriformis. | O. Semimembranosus. |
| F. Upper gemellus. | P. Biceps cruris (long head). |
| G. Obturator internus, cut. | R. Semitendinosus. |
| H. Lower gemellus. | T. Origin of adductor magnus. |
| I. Cut ends of the quadratus femoris. | U. Great sacro-sciatic ligament. |
| | V. Small sacro-sciatic ligament. |

The *gluteus minimus*, C, is somewhat pyramidal in form, and is attached to the hip-bone and femur, like the gluteus medius, beneath which it lies. It arises from the space between the two curved lines on the back of the hip-bone, and extends backwards to the line of union of the iliac and ischial portions of that bone. From this attachment the fibres are directed downwards, converging to a tendon, which is inserted along the fore part of the great trochanter, and blends inferiorly with the tendon of the gluteus medius. Some of the deeper fibres end in the capsule of the hip-joint (Theile).

This muscle is covered by the gluteus medius and piriformis, and rests on the hip-bone and joint. At the anterior border is placed the tensor of the fascia lata ; and at the hinder edge, the

lower gemellus. On it lie the gluteal vessels, and the superior gluteal nerve.

In its action the muscle resembles the gluteus medius. For if the femur hangs loosely it will be abducted : and it may be rotated in by the anterior transverse fibres. When the body is supported on both legs this gluteus will act in balancing the pelvis ; and when the trunk is rotated on one limb it will bring the face to the same side. At the beginning of a step in walking it advances the hindmost leg with the gluteus medius, and then inclines the pelvis over the supporting femur whilst the swinging limb is put forwards.

Obturator internus and gemelli. On cutting through the obturator, G, and raising the inner end, three or four tendinous pieces, separated by fleshy intervals, will appear on the under surface ; and the subjacent bone will be seen to be provided with ridges of fibro-cartilage, which correspond with the fleshy interspaces. A synovial membrane lubricates the surfaces.

Near the pelvis the gemelli muscles, F and H, approach each other beneath the obturator, but near the femur they cover the tendon of the obturator ; and all three of them pass beneath the pyriformis to be inserted in front of it into the trochanter and the neck of the femur. In the Drawing the muscles are separated from each other to show the nerve to the quadratus, 8, and its accompanying artery.

The *obturator externus*, J, arises from the outer surface (in part) of the obturator membrane, and from the bone bounding anteriorly the thyroid hole. From this widened attachment the fibres are directed almost horizontally backwards to a tendon, which is inserted into the pit at the root of the trochanter.

At the fore part of the thigh the obturator is covered by the adductors (Plate XXXVII.) ; and in the second view of the buttock it is concealed by the quadratus femoris, I, except a part of the tendon which is apparent between the upper border of the quadratus and the inferior gemellus (Plate XLIX.) As the muscle passes from the front to the back of the limb it spreads over and supports the lower part of the hip-joint. Escaping beneath its lower border is the internal circumflex artery.

Like the other rotators out, the external obturator draws backwards the great trochanter when the femur hangs loosely ; and even when the hip-joint is flexed it will execute the same movement of the thigh-bone, and in this respect it differs from the other muscles of its group. When the limbs are fixed as in standing it contributes its share of power in maintaining the pelvis upright on the femur ; and in standing on one leg it helps also to fix the pelvis.

Psoas magnus, K. The tendon of this muscle inclines over the hip-joint and the neck of the femur to its insertion into the small trochanter.

The *sacro-sciatic ligaments* connect the back of the hip-bone to the sacrum and coccyx : they are two in number, and are named large and small.

The *large ligament*, U, is wide and thin internally, but thicker and pointed externally. It is attached by its widened part to the back of the hip-bone, to the side of the sacrum, and to the side of the coccyx. Its fibres are directed backwards and outwards, and being aggregated together, are inserted into the inner side of the ischial tuberosity and lower border of the hip-bone. It closes below the great sacro-sciatic notch of the pelvis, and gives origin to fibres of the gluteus maximus. Branches of the gluteal and sciatic arteries perforate the ligament, and the offsets of the posterior sacral nerves lie beneath a superficial layer of its fibres.

The *small ligament*, V, unites internally with the larger band, and is attached with it to the side of the sacrum and coccyx. Its constituent fibres are coarse, and pass outwards to be inserted into the ischial spine. By its position it divides into two apertures the space included by the hip-bone and the great ligament.

The upper and larger aperture or notch is bounded above by the hip-bone, and below by the small sacro-sciatic ligament. Through it are transmitted the pyriformis muscle, and vessels and nerves. Above the muscle issues the gluteal artery, *a*, with its veins, and the upper gluteal nerve, 4 ; and below the muscle issue the great and small sciatic nerves, 6 and 12, the pudic nerve, 10, and the sciatic and pudic vessels, *l* and *g*.

The lower and smaller aperture intervenes between the attachments of the two ligaments to the hip-bone, and gives passage to the obturator internus muscle, G, the pudic artery, *g*, with its veins, the pudic nerve, 10, and the nerve to the obturator muscle, 9, with its vessels.

ARTERIES OF THE BUTTOCK.

Parts of the gluteal, sciatic, and pudic arteries of the internal iliac; branches of the internal and external circumflex arteries; and offsets of the first perforating artery of the profunda, are included in the dissection; but the gluteal and internal circumflex will be referred to here more especially.

<i>a.</i> Trunk of gluteal.		<i>n.</i> Transverse	} of the cir-
<i>b.</i> Superficial	} of the gluteal.	<i>o.</i> Ascending branch	
<i>c, d.</i> Deep branch		<i>r.</i> First perforating of the profunda.	
<i>e.</i> Sciatic artery, cut.		<i>s.</i> Branch of perforating to the biceps.	
<i>f.</i> Coccygeal branches.		<i>t.</i> Ascending branch of perforating to join circumflex.	
<i>g.</i> Pudic artery.		†† Branches to the sciatic nerve from the sciatic artery.	
<i>h.</i> Branch of the quadratus.			
<i>l.</i> Ending of the internal circumflex.			

The *gluteal artery, a*, escapes from the pelvis through the upper part of the great sacro-sciatic notch, as before said, and divides into superficial and deep muscular branches.

The *superficial part, b*, appears between the gluteus medius and the pyriformis (Plate XLIX.), and pierces the under surface of the gluteus maximus (p. 387).

The *deep part* divides into two chief branches, which are continued forwards between the gluteus medius and minimus.

One, *c*, courses over the origin of the gluteus minimus to the fore part of the iliac crest, where it anastomoses with the external circumflex of the profunda: it furnishes branches to both the smaller glutei, but chiefly to the medius; and some offsets ascend over the iliac crest to communicate with arteries in the wall of the abdomen.

The other branch, *d*, crosses the middle of the smallest gluteal muscle, and ends in front by supplying the tensor of the fascia lata, and by anastomosing, like the upper branch, with the

external circumflex : its offsets are given to the two muscles between which it lies, but most belong to the smallest gluteus. A considerable branch passes beneath the pyriformis, and penetrates the fibres of the gluteus minimus ; some of its ramifications are prolonged to the hip-joint.

The *gluteal veins* have the same anatomy as the artery, and open into the internal iliac vein : they were removed in the dissection.

The *sciatic* and *pubic arteries*, *e* and *g*, have been described with the preceding Plate (p. 387). Several offsets of the sciatic artery, which enter the great sciatic nerve, are marked thus, †.

The *internal circumflex artery* of the profunda, *l*, (p. 376), divides beneath the quadratus into two terminal branches,—ascending and transverse.

The ascending branch, *o*, follows the obturator externus muscle beneath the quadratus femoris to the pit at the root of the great trochanter, and anastomoses there with the gluteal artery ; it gives small muscular branches to the quadratus, obturator, and gemelli, and some offsets extend to the surface of the great trochanter.

The transverse branch, *n*, passes back between the borders of the quadratus, *I*, and adductor magnus, *L*, and sends branches to the muscles attached to the ischial tuberosity, some small offsets reaching the surface of both the adductor and the great sacro-sciatic ligament, as in the Figure. It anastomoses beneath the hamstrings with the highest muscular branch of the profunda ; and with the first perforating artery of the profunda, *r*, by means of a small branch which crosses the upper edge of the adductor magnus near the attachment to the femur, and joins the ascending offset, *t*, from that perforating artery.

External circumflex of the profunda, *i*. The ascending branches of this artery course beneath the tensor of the fascia lata to the hip-bone, where they supply the glutei and the tensor, and anastomose with the gluteal artery. In detaching the gluteus medius the branches to it were cut. Offsets from it are given to the trochanter.

The *first perforating artery* of the profunda, *r*, (p. 377) comes

through the adductor magnus, and ends in the vastus externus ; it supplies offsets to the gluteus maximus and the long head of the biceps, and communicates by the branch, *t*, with the internal circumflex.

NERVES OF THE BUTTOCK.

The chief nerves of the buttock appear below the pyriformis, and are derived from the sacral plexus ; but above the pyriformis comes the upper gluteal nerve ; and on the great sacro-sciatic ligament are sacral nerves.

- | | |
|--|--|
| 1, 2, 3. Branches of the posterior
sacral nerves. | 8. Nerve to the quadratus femoris. |
| 4, 5. Branches of the superior
gluteal nerve. | 9. Nerve to the obturator internus. |
| 6. Branches of the small sciatic,
cut. | 10. Pudic nerve. |
| 7. Nerve to the upper gemellus. | 12. Great sciatic nerve: |
| | †† Cutaneous branches of the sacral
nerves. |

Posterior sacral nerves, 1, 2, 3. These are the external branches of the posterior primary trunks of the first three sacral nerves ; the highest is marked with number 1, and the lowest with 3. At first they are directed out beneath the multifidus spinæ muscle, and then unite, in the manner shown in the Figure, beneath a thin layer of fibres of the great sacro-sciatic ligament. From this plexiform union of the nerves two or three offsets are continued through the gluteus maximus to the integuments of the buttock (Plate XLVII.). The nerves are not always joined in the manner indicated.

Upper gluteal nerve. Springing from the large lumbo-sacral trunk which connects together the lumbar and sacral plexuses (p. 309), it issues from the pelvis above the pyriformis muscle with the gluteal artery. As soon as it comes into sight it divides, like the artery, into two pieces, which run forwards between the two smaller gluteal muscles.

The upper or more superficial branch, 4, enters the gluteus medius ; and the deeper part, 5, furnishes offsets to both the gluteus medius and minimus, and ends anteriorly in the tensor fasciæ latæ.

Branches of the sacral plexus. These nerves have been referred to in the preceding Plate, but some of them are more fully displayed in this deeper dissection.

The *thigh-branches* are the small and large sciatic nerves. The branches of the former have been cut across, and are marked with 6. The larger nerve is pointed out by the number 12.

The *pudic* or *perineal nerve*, 10, is directed over the small sacro-sciatic ligament to the perinæum, and is accompanied by the pudic artery and the nerve to the obturator internus.

Branches to external rotators. All the external rotators, except the obturator externus, obtain nerves from the sacral plexus. The obturator internus receives the nerve, 9, at its inner or pelvic aspect. To the upper gemellus the slender nerve, 7, is distributed; it enters the superficial surface. Two nerves enter the pyriformis at the under surface, but these are not visible until the muscle has been cut and reflected.

The quadratus and inferior gemellus are supplied by the nerve, 8, which passes beneath the upper gemellus and the obturator internus, and pierces the under surface of the quadratus near the upper border. As the nerve crosses under the inferior gemellus it sends an offset to that muscle; and as it lies on the capsule of the hip-joint, fine filaments penetrate that membrane to end in the synovial sac.

DESCRIPTION OF PLATE LI.

THE popliteal space or the ham, with its contents, is delineated in this Figure.

For the dissection of the ham the skin and the deep fascia are to be reflected by a median incision, terminated by a cross cut at each end. The large quantity of fat, which then comes into view, is to be removed with care; for articular vessels and nerves, and other nerves and arteries to muscles, cross through the deeper region of the hollow. On the side of the artery some lymphatic glands are to be separated from the surrounding fat.

FORM, SIZE, AND BOUNDARIES.

The ham is placed at the back of the knee-joint, and corresponds with the interval in front of the elbow in the upper limb. Like the intermuscular space which it resembles, it is situate on that aspect of the joint to which flexion takes place, and lodges the main vessels and nerves of the limb.

A. Biceps cruris.	E. Sartorius.
B. Semimembranosus.	F. Plantaris.
C. Semitendinosus.	G. Outer head } of the gastro-
D. Gracilis.	H. Inner head } enemius.

In form the popliteal space is lozenge-shaped, with the points directed up and down. Before its lateral boundaries are disturbed it extends about two inches and a half above the knee-joint, and downwards about one inch and a half from the same point ; but its length will vary with the degree of separation of the hamstring muscles.

This hollow is produced by the arrangement of the muscles at the knee, for the hamstrings and the heads of the gastrocnemius and the plantaris, as they pass the joint, are collected on the sides of the limb, and give rise thus to the angular interval of the popliteal space. By the removal of the muscles from the mid-line of the limb to the side, greater extent of bending is permitted in the joint.

Towards the surface the ham is closed by the teguments, and by the fascia lata strengthened by transverse fibres from the tendons of the hamstrings. And the bottom of the space is formed by the femur and the knee-joint.

Laterally it is inclosed by the intermuscular septa, which are inserted into the condyloid lines of the femur, and by the following muscles. On the outer side lies the biceps muscle, A, as low as the condyle of the femur ; and below that point come the plantaris, F, and outer head of the gastrocnemius, G. On the inner side it is limited as low as the condyle by the semimembranosus, B ; by the semitendinosus, C, lying on the other ; and by the sartorius and gracilis, D and E, which intervene between the

semimembranosus and the femur ; and below the condyle is situate the inner head of the gastrocnemius, H.

The upper and lower points or angles are constructed also by muscles. At the upper, the biceps, A, and semitendinosus, C, are in contact ; and at the lower, the inner head of the gastrocnemius, H, comes into apposition with the plantaris and the outer head of the gastrocnemius, F and G.

The depth of the space is greater above, than below the knee-joint, and is greatest opposite the inter-condyloid hollow of the femur. The widest part is on a level with the condyles of the femur.

The ham is closed on all sides except above and below, and at those spots it communicates with the back of the thigh and leg. Above, a probe can be pushed under the hamstrings along the course of the internal popliteal nerve ; and below, it can be passed under the gastrocnemius by the side of the great blood-vessels. Blood poured out from the vessels into the hollow would diffuse itself under the muscles of the thigh and leg in the channels indicated.

In the popliteal space are contained the large blood-vessels and nerves of the limb, with their branches ; a branch of the obturator nerve ; an offset of the small sciatic nerve with its artery ; and lymphatics, with much fat.

VESSELS OF THE HAM.

The chief vessels in the ham are the popliteal artery and vein, which wind from the fore part to the back of the limb above the knee, so as to pass the knee-joint on the flexion-side ; but branches of those trunks cross the space, and a small superficial artery, accompanying the small sciatic nerve, is continued through it to the leg.

- | | |
|--|---|
| <p><i>a.</i> Popliteal artery.</p> <p><i>b.</i> Upper external articular.</p> <p><i>c.</i> Upper internal articular.</p> <p><i>d.</i> Cutaneous branches with veins.</p> <p><i>e.</i> Cutaneous branch with the small sciatic.</p> <p><i>f.</i> Cutaneous branch of the anastomotic.</p> | <p><i>g.</i> Internal sural to gastrocnemius.</p> <p><i>h.</i> Short saphenous vein.</p> <p><i>i.</i> Cutaneous veins of the back of the leg.</p> <p><i>l.</i> Popliteal vein.</p> <p><i>n.</i> External sural artery to the gastrocnemius.</p> |
|--|---|

The *popliteal artery*, α , begins and ends beyond the limits of the space now defined. The part of the artery contained in the ham courses obliquely from the inner side above to the mid-point of the space below. At first it issues from beneath the semimembranosus, B, but it lies afterwards in the hollow between the condyles of the femur and the heads of the gastrocnemius. It is deeply placed throughout, and rests on the lower end of the femur and the knee-joint. Internally it is in contact with the semimembranosus, B, and with the inner head of the gastrocnemius, H; and the first muscle would serve as the guide to the position of the vessel. It has the following connections with veins and nerves:

The popliteal vein, l , is closely united to the artery throughout. At the upper end of the space it is external to the arterial trunk, whilst towards the lower end, or between the heads of the gastrocnemius, it becomes superficial to that vessel. Some small cutaneous veins, i , cross the inner side of the artery in their course to join the popliteal vein.

The internal popliteal nerve, 3, passes through the ham from the upper to the lower angle, and is much more superficial than the blood-vessels. At first it lies outside the line of the vascular trunks, but is placed over these between the heads of the gastrocnemius. Some of its branches touch the vessels: for instance the short saphenous nerve, 4, lies on the popliteal trunks below, and the nerve, 6, to the inner head of the gastrocnemius crosses them; further the azygos articular nerve, 7, enters the back of the joint beneath the vessels.

Much more superficial than the internal popliteal trunk, 3, is the continuation of the small sciatic nerve, 2, with accompanying vessels; and resting on the popliteal artery is the articular branch of the obturator nerve.

Branches of the artery. In the popliteal space the artery furnishes muscular and articular branches.

Muscular branches. These are supplied from the upper and lower parts of the trunk. The upper enter the biceps and semimembranosus; and the lower or sural, g and n , are distributed to the heads of the gastrocnemius and the plantaris.

Articular arteries. Only the upper pair is visible ; and the two are attached to the arterial trunk rather above the knee-joint. The outer branch, *b*, crosses the femur above the condyle, and passing under the biceps, leaves the ham by perforating the external intermuscular septum. The inner, *a*, is directed beneath the inner hamstrings and the tendon of the adductor magnus to the front of the knee-joint.

A single median (azygos) articular branch enters the joint through the posterior ligament, but it is concealed by the trunks of the vessels.

NERVES OF THE SPACE.

In the ham are lodged the two great trunks into which the sciatic nerve splits, with branches of these ; and in the space are offsets of the small sciatic and obturator nerves.

- | | |
|---|------------------------------------|
| 1. Internal cutaneous of the thigh. | 7. Middle articular branch. |
| 2. Small sciatic nerve. | 8. External articular branch. |
| 3. Internal popliteal nerve. | 9. Communicating peroneal branch. |
| 4. Short saphenous nerve. | 10. External cutaneous of the leg. |
| 5, 6. Branches to the heads of the gastrocnemius. | 11. External popliteal nerve. |

Popliteal nerves. At the back of the thigh the sciatic nerve divides into the internal and external popliteal trunks (Plate LII.); these are continued through the ham to the leg, and furnish branches to the surrounding parts.

The internal or larger trunk, 3, lies nearly in the middle of the limb, and takes the position, before said, to the blood-vessels (p. 400) : it gives articular branches to the knee-joint ; muscular to the gastrocnemius, plantaris, and soleus ; and a cutaneous nerve (short saphenous) to the back and outer part of the leg.

The external popliteal, 11, is placed under cover of the biceps muscle, and leaves the space below to reach the fore part of the leg. Near its commencement it gives an articular nerve, 8, to the knee-joint ; and whilst it is contained in the space two or three cutaneous nerves to the back and outer part of the leg arise from it. No muscles receive branches from this trunk.

The *small sciatic nerve*, 2, is continued through the popliteal space, immediately beneath the fascia lata, to end in the integuments of the back of the leg (Plate LIII.).

The *obturator nerve* courses along the popliteal artery to reach the knee-joint, to which it is distributed : it is more fully seen in the following Plate.

Lymphatics. Large lymphatic vessels with some glands lie along the blood-vessels. The glands are three or four in number, and through them pass the lymphatics accompanying the tibial bloodvessels and the short saphenous vein.

Fat in the ham. A loose granular fat, similar to that in the ischio-rectal fossa, fills the popliteal space, and surrounds loosely the vessels and nerves, so as to permit their necessary displacement in the movements of the knee-joint. Above and below it is continuous with the areolar tissue and fat of the thigh and leg. Abscesses form readily in it, and may acquire large size without giving rise either to swelling on the surface, or to fluctuation. From the strength and completeness of the subcutaneous boundary the pus does not find its way readily to the surface ; and to prevent this fluid burrowing upwards and downwards under the muscles, where the popliteal space is not closed by fascia, incisions should be made through the fascia lata.

DESCRIPTION OF PLATE LII.

BACK OF THIGH.

IN this Figure a view of the dissection of the back of the thigh is given.

After the popliteal space has been examined, the hinder part of the thigh may be exposed by slitting up and reflecting the skin and the fascia between the ham and the buttock. The surface of the muscles having been cleaned, these may be separated from each other to trace the vessels and nerves.

MUSCLES OF THE BACK OF THE THIGH.

Behind the femur are situate the flexor muscles of the hip-joint, which are called commonly the hamstrings. At this stage of the dissection the insertion of the gluteus maximus can be better seen than in Plate XLVIII., where the muscle is delineated.

A.B.C. Insertion of the gluteus maximus.	I. Ischial part of the adductor magnus.
D. Quadratus femoris.	J. Semitendinosus.
E. F. Insertion of the adductor magnus.	K. Semimembranosus.
G. Long head of the biceps.	L. Outer head of the gastrocnemius.
H. Short head of the biceps.	N. Inner head of the gastrocnemius.

Insertion of the gluteus maximus. The fibres of this muscle are inserted partly into the fascia lata, and partly into the femur. About the upper two thirds of the whole (as far as A) end in the fascia lata. The remaining fibres are inserted by two parts;—one, B, the larger, is fixed into the line leading from the linea aspera to the great trochanter; and the other, C, ends in the fascia lata.

Biceps flexor cruris. The muscle consists of two heads, long and short.

The long head, G, is spindle-shaped, and arises from the lower part of the ischial tuberosity in common with the semitendinosus. The short head, H, which is flattened, takes origin from the linea aspera, and from nearly the whole of the outer condyloid line of the femur, as well as from the external intermuscular septum. Both heads blend below in a tendon, which is divided into two pieces by the external lateral ligament of the knee-joint, and is inserted mainly into the head of the fibula, but a small part is prolonged to the head of the tibia: from the tendon a process is continued to the fascia of the leg.

Uncovered by muscle except above, where the gluteus maximus conceals it, the biceps lies on the adductor magnus, and crosses the great sciatic nerve. To its inner side is the semitendinosus, J.

In the lower fourth of the thigh it bounds externally the hollow of the ham, and forms the outer hamstring. Between the external lateral ligament of the knee-joint and the tendon of insertion a synovial bursa intervenes.

When the tibia is free to move the muscle combines with the other hamstrings in drawing backwards that bone and flexing the knee; and after the joint has been bent it will rotate outwards the foot. If the bones of the leg are fixed, it will assist its fellows in propping the pelvis on the femur; and if the lower limb is moveable at the hip, but immoveable at the knee-joint, the muscle will bring down and back the raised femur, thus checking flexion of the hip, and will help in putting back the leg in the process of walking backwards.

The *semitendinosus*, J, is named from its long tapering tendon near the knee. It arises from the ischial tuberosity and the tendon of the biceps. Its fibres form at first a flat muscle; but this becomes round below, and ends at the lower third of the thigh in a tendon, which is inserted into the inner side of the tibia close below the *gracilis* (Plate XLVII.).

Like the other hamstrings, it is covered above by the *gluteus maximus*; and it rests on the *semimembranosus*. To its outer side is the biceps as far as the popliteal space. At the insertion a synovial membrane envelops the tendon; and under the muscle at its origin is placed another bursa (Theile). A tendinous line crosses the muscle obliquely from the inner to the outer side, so as to divide it into an upper and a lower part, but some of the under fibres pass over this intersecting band.

Acting from the pelvis the muscle bends the knee-joint; and it will afterwards rotate in the foot. The leg being fixed and the hip-joint free to move, the muscle balances the pelvis. It will put back the raised femur in the same way as the biceps.

The *semimembranosus*, K, is the largest of the hamstrings, and arises by a tendon from the ischial tuberosity, external to and rather above the other two muscles. From this tendon which widens and becomes thin at the inner edge, but is thickened and rounded at the outer, the fleshy fibres spring, and form below a rounded belly. Inferiorly the muscle is terminated by a second

tendon, which is inserted into a groove on the inner tuberosity of the head of the tibia, and sends off the three following fibrous processes :—one backwards to join the capsule of the knee-joint; another forwards to blend with the internal lateral ligament of that joint; and a third downwards to unite with the fascia covering the popliteus muscle. At the insertion a small bursa is interposed between the tendon and the bone.

Crossing beneath the other hamstrings it is hollowed out above to lodge the semitendinosus. Beneath it is the adductor magnus. In the lower third of the thigh it bounds internally the ham, and projects into that hollow so as to cover the popliteal vessels. Between its lower tendon and the inner head of the gastrocnemius is a bursa, which is oftentimes enlarged and contains a thick glairy reddish fluid.

Being stronger than the semitendinosus it acts more powerfully in bending the knee-joint, and in rotating inwards the foot, supposing the tibia to be the part moved. In the standing posture the pelvis is propped by it and the other hamstrings. In attempts to flex the hip-joint, whilst the knee is kept extended, it can be used to check the elevation of the femur. In concert with its fellows it will depress and move back the femur, as in walking backwards. After the body has been bent forwards, as in stooping, the muscle will draw down and back the ischial tuberosity, and place the pelvis in the erect position.

Adductor magnus. This large fleshy muscle separates the hamstrings, and the nerves and vessels at the back of the thigh, from the femoral vessels and the other adductor muscles. Near the attachment to the lower end of the linea aspera the femoral vessels pass from before back through an aperture in it, which is fleshy behind but tendinous in front: this hole is bounded externally by the slip, F, which is fixed for a short distance to the inner condyloid line; and internally by the strong fibres, I, coming from the ischial tuberosity, and ending in a tendon which is fixed to the inner condyle of the femur.

VESSELS OF THE BACK OF THE THIGH.

Many branches of the profunda artery pierce the adductor

magnus, and ramify in the hamstrings. Below that muscle lie the popliteal vessels and their branches. And in the region of the buttock some small branches of the sciatic, pudic, and internal circumflex arteries are delineated.

ARTERIES.

- a. Inferior hæmorrhoidal of the pudic.
- b. Small sciatic.
- c. Internal circumflex.
- d. First perforating branch.
- e. Second perforating.
- f. Third perforating.
- g. Muscular branches of profunda.

- i. Popliteal artery.
- j. Muscular branch of popliteal.
- k. Upper external articular branch.
- l. Upper internal articular.
- n. Inner sural branch.
- r. Outer sural branch.

VEINS.

- o. Popliteal vein.
- p. Short saphenous.

Branches of the internal iliac. The two branches here seen have been previously referred to with the description of other Plates : —a, marks the *inferior hæmorrhoidal* branch of the pudic, which supplies the sphincter ani and the gut (Plate XXIX.); and, b, points out the ramifications of the *small sciatic artery* at the lower border of the gluteus maximus (Plate XLIX.).

Branches of the profunda. Most of the branches of the profunda, viz., perforating and muscular, are directed to the back of the thigh through the adductor magnus, and ramify in the hamstrings: one (internal circumflex) runs above the adductor.

Internal circumflex, c. The transverse branch of this artery passes between the edges of the quadratus femoris, D, and adductor magnus, I, and supplies the hamstring muscles (p. 305).

The *perforating arteries* are four in number, and are derived from the profunda on the front of the thigh (p. 377). All of them pierce the adductor magnus near its attachment to the femur,—the first appearing near the top of the muscle, and the last near the lower end of the linea aspera; and all, except the first, are more or less concealed by the biceps. The first is marked with d, the second with e, and the cutaneous part of the third with f: they have the following distribution :—

They (except the first) are directed outwards close to the linea aspera, and through the short head of the biceps and the external

intermuscular septum to the vastus externus and internus muscles, in which they are distributed, maintaining communications with their fellows and with the descending branches of the external circumflex artery. In the first artery, *d*, of the set there is a difference in its course, for it is higher than the short head of the biceps, and pierces the gluteus maximus. In its passage each furnishes a branch to the long head of the biceps, except the fourth when it is small; and as each artery pierces the short head of the biceps it gives a small offset to that muscle.

A *cutaneous branch* is given off from each of the three first; and this enters the fat along the line of the outer intermuscular septum.

Muscular or anastomotic branches of the profunda. These are distinct from the perforating arteries (p. 377), and pierce the adductor magnus internal to those vessels. Generally four in number, most of them are concealed by the inner hamstrings, but the two which are visible in the Figure are marked with *g*.

The highest is placed outside the line of the others, and appears about five inches from the ischial tuberosity: it supplies the semitendinosus and biceps, and anastomoses with the internal circumflex. The remaining three come out in a line through a cleft between the fibres of the adductor, and about two inches from each other: they end mostly in the semimembranosus, but one or more may give offsets also to the biceps and semitendinosus, as is the case with the lowest in this Plate. Offsets are furnished from them to the great sciatic nerve.

These vessels serve the purpose of maintaining at the back of the thigh communications with each other in the hamstring muscles, and with branches of the popliteal artery.

Near the inner border of the adductor magnus some small *cutaneous branches* issue from the muscular fibres to end in the integuments.

The *popliteal artery*, *i*, continues the femoral trunk from the front of the thigh to the back of the knee, and is represented in the upper limb by the lower part of the brachial artery. Named from its position in the popliteal space, it extends from the opening in the adductor magnus to the lower border of the popliteus

muscle, where it divides into two—anterior and posterior tibial arteries. As its connections in the lower part of the thigh differ greatly from those in the leg, it may be divided into two parts for the purposes of description.

The upper and longer part, *i*, reaches to the knee-joint, and is contained in the popliteal space. It is placed deeply in the upper part of the ham, but it becomes more superficial below in consequence of the projection backwards of the femur, and the decreasing thickness of the limb. Its direction is oblique from the inner side of the femur to the middle of the joint. At first it is overlapped by the semimembranosus, *K*, as far as the condyles of the femur, but thence to the joint it is covered by the teguments, the fascia lata, the fat, and by veins and nerves. Beneath the vessel, from above down, are placed the lower end of the femur, and the posterior ligament of the knee-joint. Above the condyles of the femur the artery is nearer the inner than the outer side of the space; and beyond that point it lies between, and close to the heads of the gastrocnemius, *L* and *N*, with the plantaris.

The popliteal vein, *o*, is closely united to the artery throughout, but it changes its position in the following way:—as far as the condyles of the femur the vein is superficial and external, so as to leave only a narrow arterial strip visible internally, but onwards to the joint the vein covers the artery. Over the artery between the heads of the gastrocnemius lies the short saphenous vein, with cutaneous and muscular branches of arteries, veins, and nerves.

Two nerves accompany the artery, viz. the internal popliteal and the obturator. The popliteal trunk passes vertically along the middle of the limb, from the upper to the lower point of the ham, and lies external to, and much more superficial than the bloodvessels; but between the condyles of the femur it is brought much nearer to the vessels, and lower down, between the heads of the gastrocnemius, it is placed over the artery and vein. Some of the branches of this large trunk come into contact with the artery:—thus the posterior articular nerve to the joint, *2*, crosses under the artery; and the short saphenous nerve, *4*, lies over the

bloodvessel in the interval between the heads of the gastrocnemius. The obturator nerve, 1, runs on the artery as far as the knee-joint, in which it ends.

From this part of the arterial trunk muscular and articular arteries are supplied, the former coming off near the top of the ham, and the latter near the knee-joint. All are so small in size as not to disturb the reparative process which would be set up in the parent trunk after a ligature has been applied to it.

Peculiarities. Very few variations in the course and condition of the artery, and in the surrounding parts are met with. Perhaps the most noteworthy change in the artery is its bifurcation into the two tibials opposite the knee-joint, instead of below that articulation.

The position of the companion vein to the artery is inconstant, at one time covering more of that bloodvessel than at another; and not very unfrequently the vein and artery change places.

Ligature. Should circumstances render ligature of the popliteal artery necessary, the spot best suited for its application would be about an inch above the condyles of the femur, where there are only small collateral branches, and where the connections are not complicated. The surface guide for the first incision will be the line of direction of the artery, and the vessel will be arrived at by cutting vertically down through the fat towards the femur. The depth of the vessel may be diminished during an operation by bending the knee so as to relax the sides of the ham. On attempting to separate the vein from the artery it should be remembered that the two are very closely united together, and that sometimes the artery is external to the vein.

Compression. Whilst the popliteal artery is contained in the intermuscular space behind the knee, pressure can be applied to impede the current of the circulating fluid. Bending the knee too, so as to make the calf of the leg touch the back of the thigh, will compress to a certain extent the artery, and will control the circulation of the blood in it; and this kind of pressure has been employed with success in later times in the treatment of aneurism of the popliteal artery.

Branches of this part of the artery. These consist of muscular and articular, as before said.

Upper muscular branches. Three or four in number they spring from the popliteal trunk soon after it enters the ham : they supply the semimembranosus and biceps, but most enter the former muscle ; and in those muscles they communicate with the perforating and muscular branches of the profunda.

The *articular arteries* ramify over, and in the knee-joint. They are five in number, viz. an upper and a lower pair, with a single central branch, but only the upper pair comes into this dissection.

The upper pair of articular branches leave the sides of the parent trunk, and are directed over the femur to the front of the limb. The *external*, *k*, passes beneath the biceps, and the *internal*, *l*, beneath the adductor magnus and the other muscles bounding internally the ham ; on the fore part of the knee they end in muscular branches to the triceps, and in anastomotic branches over the joint.

The *middle* or *azygos* artery penetrates into the joint through the posterior ligament ; it is concealed by the large popliteal nerve.

The *popliteal vein*, *o*, has the same extent, and the same connections with surrounding parts as the artery, but its position to that vessel changes. Between the heads of the gastrocnemius it conceals entirely the artery, but higher up the artery becomes more and more uncovered, and at the opening in the adductor magnus the vein is quite external.

Its contributing branches are muscular and articular, corresponding with those of the artery ; and it receives in addition the short saphenous vein, *p*, opposite the back of the joint.

NERVES OF THE BACK OF THE THIGH.

The great sciatic nerve and its two primary popliteal branches are continued along the back of the thigh to the leg. At the buttock the ramifications of the small sciatic nerve come into sight.

- | | |
|--|--|
| <ol style="list-style-type: none"> 1. Obturator nerve. 2. Posterior articular of the knee. 3. External articular of the knee. 4. Short saphenous. 5. Branches to the gastrocnemius. 6. Branch to the soleus muscle. 7. Peroneal communicating branch. 8. Nerve to short head of the biceps. { 9. Branch to adductor magnus. † A second branch to the adductor. | <ol style="list-style-type: none"> 10. Muscular branch to the hamstrings. 11. Great sciatic nerve. 12. Internal popliteal trunk. 13. External popliteal trunk. 14. Small sciatic nerve. 15. Inferior hæmorrhoidal nerve. 16. Inferior pudendal nerve. |
|--|--|

The *great sciatic nerve*, 11, takes origin in the sacral plexus (p. 310); and after passing the buttock, it is continued along the back of the thigh as far as midway between the hip and knee-joints, where it bifurcates into internal and external popliteal. In this course the nerve is covered above by the gluteus maximus, and thence by the biceps, so that it is not superficial in any part. It rests on the adductor magnus, and lies along the outer side of the semimembranosus. The point of splitting of the nerve reaches sometimes nearer the knee; at other times it takes place close to the origin from the sacral plexus, one piece piercing the fibres of the pyriformis muscle.

Its *branches* are furnished to the neighbouring muscles, viz. to the hamstrings and the great adductor.

The *branch to the hamstrings*, 10, leaves the upper part of the trunk in the thigh, and subdivides into pieces which enter the semitendinosus, semimembranosus, and the heads of the biceps. Occasionally some of those offsets arise as separate branches from the nerve-trunk.

Branch to the adductor magnus, 9. This springs from the great sciatic below the others, and sinks into the fleshy fibres about the middle of the muscle; but it is small in comparison with the size of the adductor, because the muscle is supplied mainly by the obturator nerve (p. 378). A second nerve, †, penetrates the fibres near the inner border.

The *internal popliteal nerve*, 12, is the larger of the two trunks derived from the great sciatic, and is directed to the back of the leg. It is continued through the middle of the ham, and retains the name popliteal as far as the lower border of the popliteus.

At the upper part of the ham it is placed outside the line of the bloodvessels, but it gradually approaches these near the knee, and conceals them at the lower point of the space. Its offsets are furnished to the knee-joint, and to the teguments and some muscles of the back of the leg : most of them are now seen at their origin.

Articular branches. The posterior, 2, arises near the top of the ham, and runs beneath the trunk of the nerve and the popliteal vessels to the back of the knee-joint: piercing the posterior ligament, it ends in the synovial membrane.

Another branch, lower internal, (Plate LIV.) united with the preceding or leaving the nerve below it, passes under the trunks of the bloodvessels, and accompanies the lower internal articular artery to the joint.

Branches of the gastrocnemius, 5. Each head of the muscle receives a separate nerve, and the branch to the outer head supplies an offset to the plantaris muscle.

Branch to the soleus, 6. A rather large nerve, it passes under the gastrocnemius, and enters the top of the soleus (Plate LIV.).

The *short saphenous,* 4, is a nerve for the teguments: it lies on the popliteal trunk, and then courses over the gastrocnemius, to become cutaneous below the calf of the leg (Plate LIII.).

The *external popliteal nerve,* 13, whilst contained in the ham lies under cover of the biceps muscle; but it leaves the space opposite the level of the knee-joint, and proceeds behind the tendon of the same muscle to a little below the head of the fibula, where it ends in branches for the front of the leg. In the part of its course beyond the space it is very superficial, resting on the gastrocnemius and soleus, and being covered by the integuments and fascia of the limb: here the nerve may be struck by a blow or injured by a wound; whilst higher up it is protected by the overhanging biceps, which will serve also as a guide to its position.

No muscular branch is furnished to the back of the leg, but like the other popliteal nerve it gives an articular offset to the knee, and cutaneous to the back of the leg.

The *external articular branch,* 3, leaves the parent trunk high

up in the popliteal space, and descends under cover of the biceps muscle nearly to the condyle of the femur ; at this spot it meets the upper external articular artery, and accompanying this to the outer side of the knee, divides into two pieces for the joint.

The *peroneal communicating branch*, 7, is very variable in size, and pierces the deep fascia near the upper part of the calf of the leg : to the integuments it distributes offsets, and joins the short saphenous nerve (Plate LIII.).

Obturator nerve, 1. The articular branch of this nerve begins on the fore part of the thigh (Plate XLVII.), and reaches the ham by perforating the adductor magnus near the opening for the femoral vessels. It is then directed along the popliteal vein and artery, supplying offsets to them, as far as the intercondyloid hollow of the femur ; here it quits the artery on the inner side, and enters the joint by piercing the posterior ligament.

Small sciatic nerve, 14. In the first two Plates of the dissection of the buttock this nerve has been more completely depicted than in this Figure. The origin and separation of the branches at the lower border of the gluteus maximus are visible, but most of the limb-branches have been cut through near their beginning.

DESCRIPTION OF PLATE LIII.

THE cutaneous vessels and nerves, and the superficial muscle of the back of the leg, are represented in this Illustration.

The skin is to be reflected by means of a median longitudinal incision along the back of the leg, from four inches above the knee-joint to the sole of the foot, with a transverse cut at each end of it. In the fat which then appears the superficial nerves and vessels may be found in the situations pointed out in the Figure ; though the short saphenous nerve does not come through the deep fascia till half way along the leg.

CUTANEOUS NERVES OF THE BACK OF THE LEG.

The tegumentary nerve-branches on the back of the leg are derived from the popliteal trunks, and from the small sciatic and anterior crural nerves.

- | | |
|---|---|
| 1. Inner branch of the internal cutaneous of the thigh. | 5. Peroneal communicating branch. |
| 2. Internal or long saphenous. | 6. Cutaneous branch of the outer part of the leg. |
| 3. Small sciatic. | 7. Internal popliteal nerve. |
| 4. External or short saphenous. | 8. External popliteal nerve. |

Internal cutaneous of the thigh. The inner branch of this nerve, 1, becomes cutaneous close above the knee-joint, and descending over the inner belly of the gastrocnemius, reaches about half way to the heel. Near the knee it is joined by a small branch from the internal saphenous.

Internal or long saphenous nerve, 2, escapes from beneath the sartorius on the inside of the knee; piercing then the deep fascia, it enters the subcutaneous fatty layer, and accompanies the vein of the same name to the inner side of the foot. A small communicating branch unites it and the internal cutaneous.

The *small sciatic nerve, 3,* passing through the ham, pierces the deep fascia below that space. When cutaneous, it is applied to the short saphenous vein, and sending offsets around the vessel, is continued to the middle, or the lower third of the leg. Inferiorly it unites with an offset of the short saphenous nerve.

The *external or short saphenous nerve, 4,* coming from the internal popliteal trunk (p. 412), courses along the back of the leg and below the outer ankle, with the vein of the same name, to the outer side of the foot and little toe. In this course it lies beneath the deep fascia till about half way down the leg, where it enters the fat, and is joined by the peroneal communicating branch, 5. It distributes offsets to the integuments of the leg below the calf, and many branches of large size to the outer side of the heel and foot.

The *peroneal communicating branch, 5,* is derived from the

according to Quain int. Pop. & ext. pop. give off resp. Peroneal Communicating wh' join above ankle to short saphenous nerve

external popliteal nerve: appearing superficial to the fascia, it joins the short saphenous as soon as this becomes cutaneous. To the outer side of the leg it furnishes a considerable cutaneous branch, 6, which reaches two thirds or more of the distance to the heel: this branch may arise separately from the external popliteal trunk.

One or two other cutaneous nerves for the upper and outer part of the leg are supplied by the external popliteal nerve.

SUPERFICIAL VESSELS OF THE BACK OF THE LEG.

Both cutaneous arteries and veins are found with the cutaneous nerves at the back of the leg.

ARTERIES.

- a. Trunk of the popliteal.
- b. Muscular branch of popliteal.
- c. Cutaneous branch with short saphenous nerve.
- d. Cutaneous branch with peroneal communicating nerve.
- e. Cutaneous part of the anastomotic artery.

VEINS.

- g. Trunk of the popliteal.
- h. Internal or long saphenous.
- i. External or short saphenous.
- j. Communicating branch between saphenous veins.
- k. Communicating to saphenous from posterior tibial.

Cutaneous arteries. Many of these perforate the deep fascia at intervals, and some pierce the gastrocnemius; but the longest and largest accompany the superficial veins.

The branch, c, with the *short saphenous nerve* springs from the popliteal trunk near the knee-joint, and accompanies the vein beneath the fascia to reach the integuments.

The branch, d, with the *peroneal communicating nerve*, begins in a muscular branch of the popliteal trunk, and runs with an offset of the nerve to the integuments of the outer part of the calf.

A branch with the *small sciatic nerve* is supplied from the muscular artery, b, and reaches the integuments below the upper third of the leg.

The *cutaneous branch, e*, of the *anastomotic* appears at the knee; escapes from beneath the sartorius, and is continued onwards with the internal saphenous nerve.

Superficial veins. Two in number, and named saphenous, they begin on the dorsum of the foot—one on the outer, and the other on the inner side.

The *internal saphenous*, *h*, the larger of the two, appears only for a short distance on the inner side of the knee and calf of the leg. Upwards it is prolonged to the thigh, and downwards it is continued to the foot with the nerve of the same name. At the knee it is joined by branches from the deep veins.

The *external or short saphenous*, *i*, begins on the outer side of the foot in the venous arch on the dorsum (Plate LVIII.). Bending below the outer ankle, it ascends in the teguments along the outer border of the tendo Achillis, and the middle line of the calf of the leg to the popliteal space, where it ends by joining the popliteal vein. In the lower half of the leg it lies with the short saphenous nerve, and in the upper half with the small sciatic nerve. About the foot and heel it receives many branches both superficial and deep; higher in the leg it is joined by branches from the teguments and deeper parts, and communicates with the internal saphenous vein—one of the last set of branches being marked with *j*.

MUSCLES OF THE BACK OF THE LEG.

The superficial layer of muscles, forming the projection of the calf, is delineated in this and the following Plate. In the Illustration a view of the undisturbed condition of the popliteal space is also obtained.

- | | |
|-------------------------------------|------------------------------------|
| A. Biceps cruris. | G. Plantaris, belly of the muscle. |
| B. Semimembranosus. | H. Outer head of gastrocnemius. |
| C. Semitendinosus. | I. Tendon of the plantaris. |
| D. Sartorius. | J. Soleus muscle. |
| F. Inner head of the gastrocnemius. | K. Tendo Achillis. |

Popliteal space. In this Figure the intermuscular hollow is represented as it appears in form and size before the lateral boundaries are disturbed. In Plate LI. the space is shown as it is usually described.

As now seen the ham measures about three inches in length, and one and a half in width at the widest part; and its diminished size is due to the approximation of the biceps, A, and semimembranosus, B, over the hollow. Like the axilla, the space extends largely under the muscles though it has but a comparatively small surface opening; and it is prolonged upwards between the femur and the hamstrings. Tumours in the space, projecting under the muscles bounding laterally the ham, would not be recognised with facility in consequence of the fleshy coverings over them.

Vessels. In the undisturbed state of the ham the popliteal vessels are laid bare only for a very short distance. About an inch of the *popliteal artery*, *a*, is visible—the part opposite the condyle of the femur, which comes from beneath the semimembranosus, and disappears under the inner head of the gastrocnemius.

A muscular branch, *b*, leaves the trunk of the artery here, and supplies the biceps and semimembranosus: this furnishes a cutaneous offset with the small sciatic nerve.

About two inches of the *popliteal vein* can be seen lying external to and in contact with the artery: at this spot the short phenous vein opens into it.

Nerves. Very unequal parts of the popliteal nerves appear in the hollow of the ham before the muscles are drawn apart from each other. About three inches of the internal popliteal trunk is uncovered; but strictly speaking only an inch of the external popliteal, for the greater part of the nerve here delineated lies out of the ham, and rests on the gastrocnemius and soleus muscles.

Muscles of the calf of the leg. Three muscles form the calf of the leg, viz., gastrocnemius, soleus, and plantaris, but only the first is illustrated in this Figure.

The *gastrocnemius*, the most superficial of the muscles of the calf, consists of two halves or bellies, F and H, which unite below a common tendon.

The inner half of the muscle is attached above by tendon to the posterior part of the inner condyle of the femur, and by

fleshy fibres to the condyloid line for about an inch. And the outer belly is fixed also by tendon to the outer condyle of the femur, viz. to the upper and hinder part, but chiefly to an impression on the outer surface. Fleshy fibres soon succeed to each tendon of attachment, and descend, forming separate bellies (inner and outer), to end in the wide common tendon.

The common tendon, broad and thin above, where it receives the gastrocnemius, becomes narrower below, and joins that of the soleus in the tendo Achillis, K : from it a slender piece is prolonged upwards between the halves of the muscle.

The muscle is in contact by one surface with the fascia of the leg ; and by the other with the soleus and plantaris, and the popliteal vessels and the internal popliteal nerve. The inner half or belly is more prominent than the outer, and reaches lower down the leg. At its origin the two parts of the muscle limit laterally the popliteal space.

In extension of the ankle the muscle is always combined with the soleus through the tendo Achillis ; but from its attachment to the femur it possesses a power of moving that bone, which is not shared by the soleus. Supposing the foot fixed, the gastrocnemius can draw back and down the femur, bending the knee-joint at the same time, as is exemplified in stooping to the ground, or in squatting. In walking backwards it will assist the soleus, the knee-joint being kept straight by the extensors, in bringing the limb over the projected foot.

DESCRIPTION OF PLATE LIV.

THE soleus and plantaris muscles, and the lower part of the popliteal vessels and nerves, are laid bare in this view.

On cutting through the heads of the gastrocnemius opposite the knee-joint, and removing that muscle as far as the common

tendon, the subjacent muscles, vessels, and nerves, will be displayed as soon as the fat and areolar tissue have been removed.

MUSCLES OF THE CALF OF THE LEG.

The deeper muscles of the calf, viz., the soleus and plantaris, cover the bones of the leg ; and above these, at the back of the knee-joint, lies the popliteus—one of the deep layer of muscles.

A. Biceps cruris.	G. Plantaris.
B. Semimembranosus.	H. Outer head of gastrocnemius.
C. Semitendinosus.	I. Popliteus.
D. Sartorius.	J. Soleus.
F. Inner head of gastrocnemius.	K. Tendo Achillis.

The *plantaris*, G, possesses a short rounded belly, from three to four inches long, and a narrow, slender tendon, the longest in the body. The muscle arises by fleshy fibres from the outer condyloid ridge of the femur, above the attachment of the outer head of the gastrocnemius. Opposite the upper edge of the soleus the fibres end in the tendon, which is prolonged between the gastrocnemius and soleus and along the tendo Achillis, to be inserted into the back of the os calcis at the inner side of, or with that tendon.

At its origin the muscle appears inside the external head of the gastrocnemius, and forms part of the outer boundary of the popliteal space. As far as half way down the leg it is covered by the gastrocnemius ; but where this muscle ends in a tendon the plantaris becomes cutaneous, and then lies along the inner border of the tendo Achillis.

Its action though slight is similar to that of the gastrocnemius, for if the foot is unsupported it will extend the ankle ; or, the foot being fixed, it will help to bend the knee, as in stooping.

The *soleus*, J, the deepest muscle of the calf, is named from its flattened and widened form. It is attached to both bones of the leg, viz., to the head and upper third (sometimes half) of the posterior surface of the fibula, to the oblique line across the posterior surface of the tibia, as well as to the middle third of

the hinder border of this bone. And between the two bones it is connected with a tendinous band, which bridges over the popliteal vessels and nerves. About midway between the knee and the heel the fleshy fibres end in a tendon, which blends with that of the gastrocnemius.

On the cutaneous surface rest the plantaris and gastrocnemius ; and underneath the soleus are the deep muscles of the leg, with the main blood-vessels and nerve of the limb. The fibular attachment is thick and fleshy, and the tibial, thinner than the other, is aponeurotic on the under surface (Plate LV.). Parallel to the upper border is the popliteus muscle, I.

The *Tendo Achillis*, K, is formed by the union of the aponeuroses of the gastrocnemius and soleus about half way down the leg. At its upper end it measures about three inches in width, and is thin, but it gradually tapers downwards, becoming thicker and rounded near the heel ; and finally it is inserted by a somewhat widened part into the lower half of the posterior surface of the os calcis. In Plate LV. a bursa is shown, separating the tendon from the upper part of the bone. Comparatively superficial throughout, it is covered only by the teguments and the deep fascia ; and along the outer side, below, are placed the short saphenous vein and nerve.

In deformity of the foot with elevation of the heel, division of the tendon is needful to allow the os calcis to be put in contact with the ground. In the execution of this operation the cutting instrument is entered beneath the tendon about an inch above the heel, and on the inner side ; and the tendon being put on the stretch by forcible flexion of the ankle, the knife is carried outwards through it, with a sawing movement, care being taken not to divide the integuments as the last part of the tendon is cut through.

Sometimes the tendon is ruptured across in the living body by the forcible and sudden action of the fleshy fibres. When this accident happens, the broken ends are separated widely, the upper fragment being raised by the contraction of the fleshy bellies, and the lower piece being depressed by the descent of the os calcis through flexion of the ankle. With the view of approxi-

mating the ends, the heel should be raised by forced extension of the ankle, and the knee should be bent to relax the gastrocnemius; by the adoption of the position here indicated, the upper end, which is liable to the greatest displacement, may be more readily depressed towards, and retained near the lower fragment by a bandage on the leg.

Use of the gastrocnemius and soleus. These muscles raise the os calcis, and in this way extend the ankle. Should the toes rest on the ground, so as to render the foot immoveable, the muscles can still raise the heel with the weight of the body, as in the different kinds of progression, or in standing on the toes.

If the lower attachment becomes the fixed point the soleus can render the leg-bones steady on the foot, and the gastrocnemius and plantaris will support the knee-joint, as in the straightened state of the limb in standing. During stooping to the ground the gastrocnemius and plantaris will assist in bending the knee; and in the act of rising from that posture the soleus brings back the bones of the leg over the astragalus.

Before the foot reaches the ground in walking backwards the muscles point the toes; and after the sole touches the ground they incline back the slanting limb over it.

LOWER PART OF THE POPLITEAL VESSELS.

The part of the popliteal vessels here referred to extends beyond the limits of the ham, and is laid bare by reflecting the gastrocnemius.

- | | |
|---|-------------------------------------|
| a. Popliteal artery. | e. Lower external articular artery. |
| b. Upper muscular branch. | f. Lower internal articular artery. |
| c. Branch to inner head of the gastrocnemius. | g. Branch to the soleus. |
| d. Branch to outer head of the gastrocnemius and the plantaris. | h. Popliteal vein. |
| | i. Internal saphenous vein. |
| | k. External saphenous vein, cut. |

Popliteal artery, a. The part of this artery which is now visible extends from the knee-joint to the lower border of the popliteus muscle, I. Covered by the gastrocnemius (now reflected),

it is crossed near the ending by the small tendon of the plantaris, and its point of splitting into the tibials is concealed by the soleus, J. Beneath it lies the popliteus, I.

Superficial and close to the artery is the popliteal vein, which gradually inclines inwards, so as to be placed altogether inside at the lower border of the popliteus.

The internal popliteal nerve, coursing along the blood-vessel, changes its position to the artery in the same manner as the vein; for opposite the back of the knee-joint it lies between the vessel and the surface, but is internal to the artery at the lower border of the popliteus.

Branches. From this part of the popliteal arise the lower muscular offsets, and the lower pair of articular arteries.

The *lower muscular branches* are furnished to the muscles of the calf, viz., gastrocnemius, soleus, and plantaris.

Branches to the gastrocnemius, c and d. Two in number, they are named, commonly, *sural*. The artery, *c*, enters the inner fleshy belly of the muscle; and the vessel, *d*, ramifying in the outer belly, gives a small offset to the plantaris.

Branch to the soleus, b. Accompanying the nerve of the same name, it pierces the upper part of its muscle at the cutaneous aspect.

The *lower pair of articular arteries* are directed, one outwards the other inwards, to the front of the knee-joint.

The *outer, e*, runs above the head of the fibula and beneath the external lateral ligament to the outer part of the knee where it anastomoses with the other articular arteries over the joint.

The *inner, f*, lying at a lower level than its fellow, passes beneath the internal lateral ligament to the inner side of the articulation, and terminates like the other. A small articular nerve takes the same course.

The *popliteal vein, h*, begins by the union of the anterior and posterior tibial veins at the spot where the artery ends. Internal to the artery at first, it becomes afterwards superficial, and the external, as before said. The branches joining it in this part are companions to those of the artery.

POPLITEAL NERVES.

These nerves and most of their branches have been illustrated in preceding Plates, but some of the muscular offsets of the internal nerve may be now observed more completely after the removal of the gastrocnemius.

- | | |
|--|---|
| <ol style="list-style-type: none"> 1. Internal popliteal trunk. 2. External popliteal trunk. 3. Branch to inner head of the gastrocnemius. 4. Branch to outer head of the gastrocnemius. | <ol style="list-style-type: none"> 5. Branch to the plantaris. 6. Branch to the soleus. 7. Lower internal articular branch. 8. Short saphenous (origin). 9. Branch to the popliteus. 10. Short saphenous (lower end). |
|--|---|

Internal popliteal trunk, 1. The muscular branches of this nerve are furnished to the muscles of the calf and the popliteus. The nerves to the superficial muscle of the calf, viz., gastrocnemius, have been before noticed (Plate LIII.).

The *branch to the plantaris muscle*, 5, is an offset of the nerve to the outer head of the gastrocnemius; it enters the fleshy fibres of its muscle with a small twig of an artery.

The *branch to the soleus*, 6, descends beneath the gastrocnemius, and divides into pieces which penetrate the muscle near the upper attachment to the bones of the leg, and at the superficial aspect.

The *branch to the popliteus*, 9, arises opposite the knee-joint, and passes beneath the plantaris to the lower border of its muscle: at this point it bends round the edge of the popliteus, and enters the under surface.

Lower internal articular nerve, 7, which is shown at its origin in Plate LII., appears from beneath the popliteal vessels, and passes along the upper border of the popliteus muscle with the artery of the same name; it then runs beneath the internal lateral ligament to the fore part of the knee, where it pierces the capsule of the joint.

External popliteal trunk, 2. Nearly the same view of this nerve is given in this as in the preceding Plate. Inferiorly it passes beneath the peroneus longus, and divides between that

muscle and the fibula into its terminal branches for the fore part of the leg, viz., recurrent articular, musculo-cutaneous, and anterior tibial.

DESCRIPTION OF PLATE LV.

THE deep muscles, vessels, and nerves of the back of the leg are exhibited in this Plate.

The dissection for this view will be prepared by reflecting the muscles of the calf, and removing the fascia and fat which then come into sight. An aponeurosis covering the central muscle is to be divided longitudinally, and to be thrown inwards and outwards with fibres of the two lateral muscles attached to it.

DEEP MUSCLES OF THE BACK OF THE LEG.

In this group there are four muscles : three are prolonged to the foot and extend the ankle as they pass by ; and the fourth, crossing behind the knee, flexes this joint.

- | | |
|------------------------------------|--------------------------------|
| A. Popliteus. | F. Tibialis posticus. |
| B. Fibular origin } of the soleus. | G. Tendo Achillis, cut. |
| C. Tibial origin } | H. Peroneal muscles covered by |
| D. Flexor longus pollicis. | fascia. |
| E. Flexor longus digitorum. | |

The *popliteus muscle*, A, intervenes between the contiguous ends of the femur and tibia, crossing behind the knee-joint. It arises within the capsule of the joint by a tendon which is fixed to the fore part of a groove on the outer condyle of the femur ; and, outside the capsule, by fleshy fibres attached to the posterior ligament. The muscle is thin and fleshy, and is inserted below the head of the tibia into an impression on the posterior surface of the bone.

A special aponeurosis covers the muscle, and separates it from other parts. Towards the surface the popliteus is concealed by the gastrocnemius and plantaris; and is crossed by the popliteal vessels and the internal popliteal nerve. Beneath it is the tibio-peroneal joint with the upper end of the tibia. Along part of the upper border run the lower internal articular vessels and nerve; and contiguous to the lower edge is the soleus muscle. The tendon of origin within the capsule of the knee is surrounded by the synovial membrane in the same way as the biceps is incased in the shoulder-joint.

By the contraction of the muscle the tibia will be moved backwards towards the femur, producing flexion of the knee; and after the joint has been bent the popliteus can turn in the tibia, so as to give rise to rotation inwards of the foot.

The *flexor longus pollicis*, D, is the most external of the three muscles entering the foot. Placed over the fibula, it takes origin from the posterior surface of that bone below the soleus, except about an inch inferiorly; its fibres are further attached internally to an aponeurosis covering the tibialis posticus, and externally to the fascia separating it from the peronei muscles. Near the ankle the muscle ends in a tendon, which is continued to the foot through a separate compartment in the annular ligament, and along a groove in the astragalus; its further course through the foot to the great toe is shown in Plate LVI.

The upper part of the muscle is covered by the soleus; and the lower, which lies outside the tendo Achillis, is in contact with the deep fascia. The muscle rests on the fibula, its length of attachment to the bone varying with that of the soleus, and it conceals in part the tibialis posticus. In its fibres are contained the peroneal vessels. By the outer border it is contiguous to the peronei muscles, only fascia intervening; and by the inner edge it touches the posterior tibial nerve for its lower two thirds, but this connection has been destroyed by the displacement of the muscle.

With the foot hanging the first action of the muscle will be employed in bending the great toe, and the next in extending the ankle. When the foot is fixed this flexor assists the special

extensors of the ankle in walking, and the flexor longus digitorum in standing on the toes.

If the lower end of the muscle becomes the fixed point, the fibula, when placed in front of the astragalus, will be brought backwards to a right angle with the foot, as is seen in rising from a stooping posture, and in walking backwards.

The *flexor longus digitorum*, E, lies on the tibia, and is the most slender of the muscles in the deep layer at the back of the leg. It arises from the posterior surface of the tibia, beginning at the attachment of the soleus, and extending to three inches from the lower end; and some fibres are connected externally to the aponeurosis covering the tibialis. Near the ankle the muscle ends in a tendon, which passes behind that of the tibialis through a separate sheath in the annular ligament, and entering the foot ends in slips for the four outer toes (Plate LVI.).

In the leg this flexor is placed beneath the soleus for half its length, but the rest of the muscle projects inside the tendo Achillis and supports the tibial vessels. By the under surface it touches the tibia as far as to three inches from the inner malleolus, where it is separated from that bone by the intervention of the tibialis posticus. Along the outer edge lie the tibial vessels for about the upper half of its length, but below that point it projects outwards beyond the vessels.

The foot being moveable the long flexor will bend the four outer toes, and extend afterwards the ankle. If the foot rests on the ground, so that the toes are rendered immovable, the muscle will be united in its action with the preceding flexor to raise the weight of the body, as in standing on the toes, or in walking.

Supposing the tibia placed in front of the astragalus, as in stooping, the muscle acting from below will assist in bringing that bone to a right angle with the foot.

The *tibialis posticus*, F, is the central muscle of the deep layer, and covers the membrane between the bones. It has a wide origin from the interosseous membrane, the tibia, and the fibula;—viz., from all the membrane except an inch below; from a special surface on each bone, which is contiguous to the membrane, and reaches down as far as two inches from the malleolus; and some

fleshy fibres are also attached to the aponeurosis covering the surface. Inferiorly the muscle passes between the tibia and the flexor longus digitorum; and its tendon is transmitted to the foot through the inner space of the annular ligament, lying in the groove in the inner malleolus. Its insertion into the scaphoid and other bones of the foot appears in Plate LVII. Fig. 2.

Situate between the flexors of the digits, the tibialis is covered by the thin aponeurosis which is fixed into the leg-bones, and superficial to all is the soleus: on it lie the tibial vessels and nerve for the upper half. Beneath it is the interosseous membrane. Superiorly there is an interval between its attachments to the bones, through which the anterior tibial vessels pass; and inferiorly the muscle is directed inwards beneath the flexor longus digitorum.

Should the foot be free to be moved the tibialis posticus will draw it down and back so as to extend the ankle, and will direct inwards the great toe. If the foot rests on the ground, the muscle uniting in its action with the tibialis anticus will raise the inner edge, as in standing on the outer border of the foot.

When the bones of the leg slant forwards, as in stooping, the muscle taking its fixed point below will combine with the deep flexors of the digits in bringing back the tibia over the astragalus, as the leg is straightened.

DEEP VESSELS OF THE BACK OF THE LEG.

At the back of the leg, as on the front of the forearm, the main artery of the limb bifurcates just beyond the joint, and from the chief of the two pieces into which it splits is given a third artery, so that in each member there exists one leading vessel where there is a single bone, and three where there are two bones.

ARTERIES.

- a.* Popliteal trunk.
- b.* Lower and external articular.
- c.* Lower internal articular.
- d.* Anterior tibial trunk.
- e.* Peroneal trunk.
- f.* Continuation of peroneal.
- g.* Posterior tibial trunk.

VEINS.

- k.* Popliteal trunk.
- l.* Peroneal venæ comites.
- n.* Venæ comites, posterior tibial.
- o.* Communicating from deep to superficial veins.
- p.* Internal saphenous.

The *anterior tibial artery*, *d*, is one of the two trunks into which the popliteal splits at the lower border of the popliteus muscle ; it passes above the interosseous membrane to the front of the leg, and its anatomy is illustrated in Plate LVIII.

The *posterior tibial artery*, *g*, the other trunk obtained from the division of the popliteal, extends to the sole of the foot, and ends in the plantar arteries. It is limited by the lower border of the popliteus in one direction, and by the lower edge of the internal annular ligament in the other. On the surface of the limb its position would be indicated by a line from the centre of the knee-joint to a point midway between the heel and the ankle. The upper half of the vessel lies deeply, and the lower is comparatively superficial.

Upper half. Placed beneath the soleus, as is seen in the preceding Plate, it rests on the tibialis posticus, *F*. Close to it internally is the flexor longus digitorum, and lying outside it near the termination is the flexor longus pollicis.

Companion veins course along the sides of the artery, and join across it at short distances.

The large posterior tibial nerve lies close to the artery : at the upper end it is internal, but it becomes external to that vessel below the origin of the peroneal artery ; and it keeps afterwards the same position.

Lower half. Below the middle of the leg the soleus ends in a tendon, and the artery, gradually inclining inwards, comes to lie between the tendon and the edge of the tibia. Here it is covered by the deep fascia and teguments, and lies on the flexor longus digitorum and the end of the tibia : on its outer side is placed the flexor longus pollicis as in the upper part.

The venæ comites and the posterior tibial nerve have the same position to the lower as to the upper half.

Between the heel and the ankle the artery passes under the internal annular ligament, and over the ankle-joint ; and it divides at the lower border of that band into the two plantar arteries. Internal to it at this spot lies the tendon of the long flexor of the toes, and external and nearer to it, the tendon of the long flexor

of the great toe. The companion veins and nerve have the same position as above.

Size and position of the branches. Numerous small branches, chiefly muscular, arise at intervals along the artery; but about one inch and a half from the beginning springs the large peroneal trunk, and near the ankle-joint a branch of intermediate size (communicating) leaves it.

Ligature of the artery. In the living body the artery is not likely to need tying except in the case of a wound of the leg or foot, and reference will be afterwards made to those injuries; but the placing a ligature on the vessel in the dead body may be practised in both the upper or deep, and the lower or superficial part.

In the upper half. Where the posterior tibial is covered by the soleus it may be reached in the following way:—A longitudinal incision about four inches long is to be carried through the integuments and deep fascia at the distance of an inch behind the edge of the tibia:* this cut should lie behind the internal saphenous vein, and near the edge of the gastrocnemius (Plate LIII.). Should this last muscle come into sight it is to be turned aside, and the soleus, which then appears, is to be cut through for the whole length of the superficial incision; whilst this step is being executed the ankle is to be extended with the view of relaxing the muscle, and as the fleshy fibres are divided an aponeurosis on the under surface shows itself. On carefully cutting through this aponeurotic part, and a thin piece of the deep fascia under it, the blood-vessels will be arrived at immediately beneath, though external to the line of the incision.

To find the artery, look for the posterior tibial nerve, which lies on the outer side of, and may be taken as the deep guide to the vessel.

Only a very thin sheath encloses the vessels; and in opening and detaching it care should be taken of the venæ comites.

* If the cut is made near the edge of the tibia, with the view of separating this muscle from the bone, as is sometimes recommended, the student is apt to detach also the deep flexor of the toes, and to experience some difficulty in finding the interval between the muscles.

In passing the ligature let the aneurism needle be moved from right to left, and without including the veins.

Occasionally no artery may be met with, for it may be wanting in this part of the leg.

In the lower half. Where the posterior tibial is uncovered by muscle the surface line before given will serve as the superficial guide to its position. A cut about two inches and a half long is to divide the teguments in that line: some branches of the internal saphenous vein and nerve will probably be cut through in this stage, but the knife should be used far enough back to be clear of the trunk of the vein. Nextly the deep fascia of the limb is to be incised on a director or without, according to the skill of the operator.

Beneath the fascia the posterior tibial nerve may be recognised, and it will serve as the guide to the artery in the wound: to the inner side of the nerve lie the blood-vessels.

When opening the sheath, and passing the thread around the vessel, the same precautions are to be taken as in ligature of the artery higher up.

Wounds of the artery are more likely to happen in the lower part of the leg where the vessel is near the surface than where it is covered by the soleus muscle. If the injury has its seat in the lower half of the leg the wound may be enlarged, and two ligatures may be applied to the blood-vessel so as to arrest the flow of blood from each end. But if the artery is opened through the soleus the depth will increase greatly the difficulty of finding the bleeding vessel in the bottom of the wound. In this case some surgeons have recommended that the wound should be enlarged, and that the vessel should be tied, as before said; but others would prefer to try the effect of pressure applied to the wound and the main vessel of the limb before undertaking so difficult an operation.

Branches of the posterior tibial. With the exception of the large peroneal artery the other branches are small in size.

Muscular branches arise from both sides of the trunk all the way along: two or three are supplied to the fibular and tibial attachments of the soleus; and the larger of these pierces the

tibial part, and ramifies on the head of the tibia and the inner side of the knee-joint. The remaining offsets enter the tibialis posticus and the flexors of the digits.

Cutaneous offsets. Some small branches pierce the fascia in the lower half of the leg, and end in the teguments (Plate LIII.): one or two of this set arising near the ankle, run with the cutaneous plantar nerve, 7, to the sole of the foot.

Nutritious of the shaft of the tibia. It is derived from one of the upper muscular branches, and pierces the fibres of the tibialis posticus to enter the canal on the posterior surface of the bone.

A *communicating branch* is directed transversely outwards across the lower end of the tibia to join with a like offset from the peroneal artery; it is concealed by the flexor longus pollicis.

The *articular branches* arise from the artery opposite the ankle-joint, and are distributed to that articulation.

The *venæ comites*, *n*, of the posterior tibial artery lie on the sides of that vessel, over which they are united by cross pieces: they have the same extent as the artery, viz., from the foot to the lower border of the popliteus. Above, they unite with the anterior tibial veins to form the popliteal vein. At the lower part of the leg they are thick and strong.

The *peroneal artery*, *e*, is the largest branch of the posterior tibial, and arises one inch and a half from the beginning of that trunk. To reach the fibula it passes between the soleus and the tibialis posticus; and it is then continued along that bone, contained in the fibres of the flexor pollicis. Much diminished in size at the lower part of the interosseous membrane, the vessel, *f*, is continued behind the external malleolus to the outer side of the heel; here it ends in branches, of which some supply the foot, and others anastomose with offsets of the posterior tibial, and external plantar and tarsal arteries.

Two companion veins run with the artery, and the nerve to the flexor pollicis lies on it oftentimes.

Its *branches* are muscular and communicating, but they are concealed by the flexor pollicis.

Muscular branches enter the muscles with which it is in contact, viz., soleus, tibialis, and flexor pollicis; and some wind round

the outside of the fibula, lying in grooves in the bone, to reach the peronei.

The *nutritive artery of the bone* is furnished by one of the muscular branches, and enters the aperture in the shaft of the fibula, after piercing the tibialis: it is smaller than the artery to the shaft of the tibia.

Communicating branches. Two in number, anterior and posterior, they serve the purpose of anastomosing with the anterior and posterior tibial arteries.

The anterior passes to the front of the leg through an aperture in the lower part of the interosseous membrane, and is commonly named *anterior peroneal*. It is continued to the dorsum of the foot on the outer side, and some of its offsets anastomose with the external malleolar and tarsal arteries. When the anterior tibial trunk is unusually small, or is wanting on the foot, this communicating branch is proportionally augmented, taking the place of the deficient artery in the one case, and assisting the smaller trunk in supplying the foot in the other condition.

The posterior communicating lies beneath the flexor pollicis, opposite the lower end of the tibia, and unites with a similar branch of the posterior tibial (p. 431). Sometimes there is a second communicating artery lower down. If the trunk of the posterior tibial is absent in the lower part of the leg this branch of the peroneal, much increased in size, takes the place of that blood-vessel, and enters the sole of the foot to supply the plantar arteries.

The *companion veins*, *l*, (venæ comites) of the peroneal artery lie on the sides of that vessel, and communicate across it: they receive branches corresponding with the offsets of the artery, and end above in the posterior tibial veins.

The *posterior tibial nerve*, *9*, is a continuation of the internal popliteal trunk, and extends from the lower border of the popliteus muscle to the space between the inner malleolus and the os calcis, where it divides near or beneath the annular ligament into the two plantar nerves. Its connections with muscles are the same as those of the blood-vessel. In close contact with the artery throughout, it changes its place with respect to the vessel: thus

for an inch and a half it lies inside, but thence to its termination outside the artery.

Its *offsets* are chiefly supplied to the contiguous muscles, but it gives a cutaneous nerve to the sole of the foot.

The *muscular branches*, 4, 5, 6, enter the *tibialis posticus*, *flexor digitorum*, and *flexor pollicis*: they arise at intervals along the nerve, or sometimes by a common branch from the internal popliteal trunk.

A *cutaneous plantar nerve*, 7, begins above the *os calcis*, and dividing into two or more branches is continued beneath the fascia and the internal annular ligament, nearly to the sole of the foot; its offsets, accompanied by small arteries, pierce separately that ligament, and end in the teguments of the under part of the heel (Plate LVI.).

The *internal saphenous vein*, *p*, begins in a cutaneous venous arch on the dorsum of the foot (Plate LVIII.); it then ascends, crossing the tibia above the inner ankle, and takes afterwards a position behind the posterior edge of that bone as far as the knee, where it has been shown passing that articulation to reach the thigh (Plate XLIV.). A nerve of the same name accompanies it.

Many superficial branches enter it in this course. In the leg it communicates with the deep veins—*anterior* and *posterior tibial*, and near the knee it joins an *internal articular vein*. In the Figure a branch, *o*, is represented uniting it with the *posterior tibial veins*.

The *internal saphenous nerve*, 8, accompanies the vein of the same name to the inner side of the foot, where it ends about the middle of the tarsus, as may be seen in Plate LVIII. In the leg it furnishes many collateral cutaneous offsets both forwards over the tibia and front of the limb, and backwards behind but near that bone.

(Calcaneus
Plantar)

DESCRIPTION OF PLATE LVI.

VIEWS of the first two dissections of the sole of the foot are represented in the Figures of this Plate.

FIGURE I.

In this Illustration the dissection of the first layer of muscles with the superficial vessels and nerves is displayed.

After the removal of the skin, the cutaneous vessels and nerves are to be sought; and when the fat and the subjacent plantar fascia have been taken away, the first layer of muscles comes into sight. The digital nerves and vessels, appearing between the muscles about the middle (in length) of the foot, are next to be traced onwards to the toes.

FIRST LAYER OF MUSCLES.

Three muscles enter into this layer:—the central one is the short flexor of the toes; the muscle in a line with the great toe is the abductor pollicis; and that lying along the outer border of the foot is the abductor minimi digiti.

- | | |
|------------------------------------|-----------------------------------|
| A. Abductor pollicis. | K. Transverse ligament of the |
| B. Flexor brevis digitorum. | toes. |
| C. Abductor minimi digiti. | N. Flexor brevis pollicis. |
| E. Flexor tendon of the great toe. | O. Flexor minimi digiti. |
| H. Lumbricales. | P. Interossei of the outer space. |

x The *flexor brevis digitorum*, B, acts on the four outer toes; and it is called flexor perforatus from its tendons being pierced by those of the long flexor. The muscle has a narrow origin posteriorly from the inner side of the large tubercle at the back of the os calcis, and from the investing plantar fascia. About the middle of the foot it is divided into four fleshy parts, the outer being very small; and from each part proceeds a tendon to the

x corresponds (with *Gastrocnemius* + *Soleus*) to *Flex Sublimis digitorum* — wh^{ch} has become interrupted as it were. Its tendons at

root of the toe, where it enters a fibrous sheath with a slip of the long flexor (Fig. ii.). Lastly, in the sheath the tendon of the short flexor, I, (Fig. ii.) is pierced opposite the metatarsal phalanx, as in the finger, for the passage of the tendon of the other muscle, J; and it is then inserted by two parts into the sides of the middle phalanx.

The muscle is incased in a sheath of the plantar fascia, of which a piece has been shown on the surface. Along the outer side lies the abductor of the little toe, and along the inner, the abductor of the great toe. The parts covered by it are delineated in Fig. ii., viz. the tendons of the long flexors with the accessory muscles, and the plantar vessels and nerves. Its tendons decrease in size from the inner to the outer side; and that to the little toe may be very small and not pierced, or it may be even absent: near the toes they are crossed by the digital nerves.

When this flexor contracts it will move the middle phalanges of the four outer toes towards the sole, bending the first phalangeal joint, as in the fingers.

The *abductor pollicis*, A, the most internal muscle of the first layer, takes origin behind by a wide attachment to the inner part of the larger tubercle of the os calcis; to the lower border of the internal annular ligament; to the inner side of the tarsus (its ligamentous structures) as far forwards as the scaphoid bone; and to the plantar fascia, though not so largely as the other two muscles. Anteriorly it ends in a tendon, and is inserted into the inner side of the base of the metatarsal phalanx of the great toe, in union with the inner head of the short flexor.

Contained in a sheath of the plantar fascia, it is separated behind from the short flexor of the toes by an intermuscular partition, and in front by the internal plantar vessels and nerve which issue between the two. In Fig. ii. the parts covered by it may be perceived, viz. the long flexor tendons, the accessory muscle, and the internal plantar vessels and nerve.

As the name expresses the muscle will abduct slightly the great toe from the others; but as it lies almost parallel with the digit moved, it will be employed mainly in assisting the short flexor to bend the metatarso-phalangeal joint.

The *abductor minimi digiti*, C, is wide behind, like the abductor pollicis, and arises more largely from the os calcis, viz. from the fore part of the inner or larger tubercle, and from the outer tubercle; and many fibres are attached to the plantar fascia both superficially and on the outer side. In front the muscle is inserted by tendon into the outer side of the metatarsal phalanx of the little toe.

Like the two preceding muscles it is invested by the fascia. Internal to it behind is the short flexor of the toes, with an intermuscular septum of fascia intervening; and about the middle of the foot the offsets of the plantar vessels and nerves separate them. When the muscle is everted, as in Fig. ii., it will be seen to rest on the flexor accessories, F, the peroneus longus, and the short flexor of the little toe, O.

The muscle can abduct the little toe from its fellows, and bend the first joint of that toe after the same manner as the abductor pollicis.

Superficial transverse ligament of the toes, K. In the form of a flattened band it reaches from the outer to the inner toe, and consists of transverse fibres which are united to the sheaths of the flexor tendons. Under it pass the digital vessels and nerves. It serves the purpose of uniting together the roots of the digits, as in the hand. A deeper transverse ligament connects the heads of the metatarsal bones.

SUPERFICIAL ARTERIES OF THE SOLE.

Near the roots of the toes appear the digital arteries, which spring from the plantar trunks; and over the muscles ramify cutaneous vessels of the posterior tibial and plantar arteries.

- | | |
|---|---|
| a. Cutaneous branch of the sole. | f. Digital branch of first and second toes. |
| b. Internal plantar trunk. | g. Digital branch of second and third toes. |
| c. External plantar trunk. | h. Digital branch of third and fourth toes. |
| d. Digital branch of outside of little toe. | i. Digital branch of fourth and fifth toes. |
| e. Digital branch of inside of great toe. | |

Cutaneous arteries. The teguments of the posterior part of the sole receive branches from the posterior tibial trunk, and those of the rest of the foot are supplied by the plantar arteries.

The *cutaneous plantar* of the posterior tibial, *a*, is shown at its origin in Plate LV : when it is small there may be two instead of one. Piercing the internal annular ligament as one or two branches, which accompany the cutaneous nerve, it ramifies in the teguments of the under and fore part of the heel. Its *venæ comites* join the posterior tibial veins.

Cutaneous branches of the plantar arteries issue by the sides of the flexor brevis digitorum—between it and the abductor pollicis internally, and between it and the abductor minimi digiti externally ; and towards the toes the cutaneous offsets are furnished by the digital arteries :—These several branches supply the integuments anterior to the distribution of the artery, *a*.

The *plantar arteries*, the chief vessels of the sole of the foot, are two in number, inner and outer : they are derived from the splitting of the posterior tibial at the lower border of the internal annular ligament ; and their connections with muscles at the hinder part of the foot can be observed in Fig. ii.

The *internal plantar*, *b*, is directed beneath the abductor pollicis (the sole of the foot being up) to the interval between this muscle and the flexor brevis digitorum, where it becomes superficial opposite the back of the first interosseous space. It is then directed forwards and out over the flexor tendons, in company with *venæ comites* and the internal plantar nerve, and ends at the fore part of the third interosseous space by joining the third digital artery, *h*.

Whilst the artery retains its deep position it furnishes cutaneous branches of the sole, muscular branches to the abductor pollicis and flexor perforatus, and deep offsets to the bones and ligaments of the inner part of the tarsus. After the vessel reaches the surface it supplies the following superficial digital, and deep or muscular branches.

The *superficial digital branches* are three slender arteries which run forward, and are thus arranged :—

The most internal belongs to the inner side of the foot and

great toe, and gives offsets to the abductor and flexor brevis pollicis; it communicates with the artery, *f*, of the first interosseous space by a cross branch under the long flexor tendon.

The second, lying over the first interosseous space, joins the digital artery, *g*, at the root of the toes.

The third, enters the digital artery, *h*, like the others.*

The *muscular branches*, which are shown in Fig. ii., penetrate the fibres of the flexor brevis pollicis, and the inner two lumbricales muscles.

The *external plantar artery c* (Fig. ii.) has an arched course to the back of the fourth interosseous space, and there sinks under the third layer of muscles to form the plantar arch (Plate LVII.). Covered at first by the abductor pollicis, it is placed next between the flexor digitorum and the accessorius, *F*, and finally it lies in the interval between the flexor of the toes and the abductor of the little toe. Venæ comites are continued on the sides of the artery; and the external plantar nerve has the same course and connections.

Collateral branches are furnished from this part of the artery to the contiguous muscles,—abductor minimi, flexor digitorum, and flexor accessorius; and to the bones and ligaments of the outer side of the foot: these last communicate with the arteries on the dorsum.

From the deep part of the plantar artery (plantar arch) the digital arteries on the sides of the toes are derived; but a more complete view of these will be obtained in the following Plate.

NERVES OF THE SOLE.

The nerves, like the arteries, consist of cutaneous and deep branches: the former come from the posterior tibial and plantar

* The condition of the artery which is represented in this Plate differs much from that which is ordinarily described. This arrangement is the common one; but the arteries of the foot, like those of the hand *su*, are subject to variations, and the distribution of the digital branches will deviate occasionally from that above given.

nerves; and the latter are the terminal pieces of the posterior tibial nerve.

- | | |
|---|--|
| 1. Cutaneous plantar nerve.
2. Internal plantar trunk.
3. External plantar trunk.
4. Digital of inner side of great toe.
5. Digital of first and second toes. | 6. Digital of second and third toes.
7. Digital of third and fourth toes.
8. Communicating of plantars.
9. Digital of fourth and fifth toes.
10. Digital of outside of little toe. |
|---|--|

The *cutaneous plantar* nerve, 1, whose origin appears in the preceding Plate, ramifies in the integuments of the heel, viz. in that part on which the foot rests in standing.

Along the sides of the flexor brevis digitorum other nerves, derived from the plantar trunks, pierce the fascia, and become cutaneous. Near the roots of the toes, and along the borders of the foot, branches are also furnished to the teguments from the digital nerves.

The *plantar nerves*, two in number like the arteries, are obtained from the bifurcation of the posterior tibial trunk beneath the annular ligament (p. 432). In Fig. ii. the first or deep part of each is visible; and their termination on the toes may be observed in Fig. i.

The *internal* nerve, supplies but few muscles, and ends anteriorly in digital branches for the three inner toes and half the fourth. Beginning on the inner side of the heel, it is directed forwards under cover of the abductor pollicis to the middle (in length) of the sole. Here the nerve becomes superficial between the abductor and the flexor digitorum, and is inclined forwards and outwards towards the fore part of the third interosseous space where it ends in the fourth digital nerve, 7. In the superficial part of its course it lies over the flexor tendons, being covered by the plantar fascia.

While the nerve is beneath the abductor pollicis it gives branches to that muscle and the flexor digitorum; and after it becomes superficial it furnishes the digital branches.

The *digital branches*, four in number, are named first, second, and so forth, from the inner to the outer border of the foot. At first they are covered by the plantar fascia, but near the root of

the toes they issue between the processes of that fascia, though the first or most internal enters the teguments farther back than the rest. Each, except the first, bifurcates to supply the contiguous sides of two toes. On the digits they are continued along the lateral aspect, as in the hand; and distributing in their course cutaneous and articular offsets, end on the last phalanx in a tuft of fine nerves from which the ball of the digit is principally supplied.

The first digital nerve, 4, courses to the inner side of the great toe, and sends many cutaneous branches to the inside of the foot anterior to the tarsus: an offset from it enters the flexor brevis pollicis.

The second digital, 5, supplies the most internal lumbricalis muscle, and ends on the sides of the second and third toes.

The third digital, 6, belongs to the neighbouring sides of the third and fourth toes, and gives a branch to the second lumbricalis muscle.

The fourth digital, 7, is distributed, like the others, to the collateral sides of the third and fourth toes, and is joined by a communicating branch, 8, from the external plantar.

The internal plantar nerve in the foot resembles the median in the hand in its supply to three digits and a half; in the arrangement of its digital branches; and in having a communication with the nerve furnished to the remaining digits. Like the median it gives branches also to the first two lumbricales, and the abductor and flexor brevis pollicis.

But as the muscles of the first digit are not alike in the hand and foot the distribution of the two nerves is not identical throughout. For instance in the foot there is not any branch corresponding with that given by the median to the opponens pollicis; and none in the hand answering to the nerve of the flexor perforatus in the foot. Lastly, the whole of the flexor brevis pollicis is supplied by the internal plantar nerve in the foot, but only the outer head of the muscle in the hand receives a branch from the median.

The *external plantar nerve*, 3, is chiefly expended in muscles, and emits digital branches only to one toe and a half, like the ulnar nerve in the hand.

It begins inside the heel with the internal plantar (Fig. ii.), and is directed outwards across the foot towards the back of the fourth interosseous space, where it sends off digital branches, and then sinks into the sole of the foot with the external plantar artery to end in deep muscles: its termination may be ascertained in Plate LVII. In this course the nerve lies at first under the abductor pollicis, nextly between the flexor brevis digitorum and flexor accessorius, and lastly in the intermuscular space between the flexor of the digits and the abductor minimi digiti. It is accompanied by the external plantar artery and venæ comites, but the nerve is not always situate on the same side.

From this part of the nerve branches are sent to the abductor of the little toe, and the flexor accessorius: these are visible in Fig. ii.

The *digital branches*, two in number, run forwards beneath the plantar fascia, and become subcutaneous near the toes, between the digital processes of that fascia: but the most external nerve pierces the fascia farther back than the other. One of the two (internal) splits at the front of the fourth interosseous space, like the branches of the other plantar nerve, to end in the adjacent borders of the fourth and fifth toes; but the other remains undivided on the outer side of the little toe. As these branches are continued along the toes they have the same arrangement as the digital branches of the internal plantar nerve.

The branch for the outer side of the little toe, 10, gives many cutaneous offsets to the anterior half of the outer border of the foot: it may supply also the contiguous muscles, viz., the flexor minimi digiti, O, and the interossei of the fourth space.

The branch, 9, which ramifies in the collateral sides of the fifth and fourth toes, communicates by means of the branch, 8, with the internal plantar, but does not supply any muscle.

FIGURE II.

The second layer of muscles of the foot, and the trunks of the plantar vessels and nerves may be studied with this Figure.

To obtain this view the first layer of muscles is to be cut

through near the heel, and is to be removed in part, as is here shown. Then the dissection will be completed after the removal of the fat and fascia.

SECOND LAYER OF MUSCLES.

In this group are included the flexors of the digits which take origin at the back of the leg, viz. flexor longus pollicis, and flexor longus digitorum with its accessory muscles. The same letters in the two Figures mark the same parts.

- | | |
|---------------------------------------|---------------------------------------|
| D. Flexor longus digitorum. | J. Tendon of flexor longus digitorum. |
| E. Flexor longus pollicis. | L. Sheath of flexor tendons. |
| F. Flexor accessorius. | N. Flexor brevis pollicis. |
| G. Inner head of accessorius. | O. Flexor minimi digiti. |
| H. Lumbricales. | P. Interossei. |
| I. Tendon of flexor brevis digitorum. | Q. Tendon of peroneus longus. |

Tendon of flexor longus pollicis, E. Issuing at the back of the foot from a groove in the astragalus and os calcis, where it is enveloped by a synovial membrane, it is directed inwards to the root of the great toe; it then enters the digital sheath, where it is incased in a second synovial sac, and is inserted into the base of the ungual phalanx.

In the foot it rests on the flexor brevis pollicis, N, and lies under the tendon of the flexor longus digitorum, D: to this last tendon it is connected by a slip, which is prolonged most commonly into those pieces of the common flexor of the digits belonging to the second and third toes, and in greatest proportion to the inner one (Turner).*

Tendon of flexor longus digitorum, D. This tendon appears on the inner part of the foot; it is then inclined towards the middle of the sole, and divides into four pieces for the four outer toes. Each of these pieces, J, enters the digital sheath with a tendon, I, of the short flexor, and having pierced that tendon is inserted into the base of the last phalanx.

* On Variability in Human Structure, by William Turner, M.B.; Trans. of Royal Soc. of Edinb., vol. xxiv.

As the tendon escapes from the internal annular ligament it lies internal to the flexor pollicis, and is surrounded by a synovial membrane as far as the place of junction with it of the accessorius muscle, F; and as it crosses over the tendon of the flexor of the great toe a communication is established between the two, as before said. Finally from the pieces into which the tendon splits a group of four accessory muscles—the lumbricales—takes origin. The parts covered by the tendon are set forth in Fig. i. of the following Plate.

Sheaths of the flexor tendons. Along the four outer toes the pieces of the short and long flexor are lodged in a partly osseous and partly membranous canal, as in the fingers. Towards the plantar surface the sheath is formed by fibrous bands, L, which are strongest opposite the centre of the two nearest phalanges, and thinnest opposite the joints; whilst at the opposite aspect it is constructed by the bones which are hollowed out to be adapted to the tendons. A synovial membrane lubricates the sheath, as in the fingers, and reaches posteriorly along the tendons nearly to the attachment of the lumbricales. In the sheath accessory bands are connected with the tendons; and these are similar to, but not so well marked as those in the hand (p. 87). In the sheath of the great toe only one tendon is contained.

Action of the flexors on the toes. In both members the bending of the digits takes place in the same order. Firstly the hinder phalangeal joint is flexed by the short flexor carrying down the middle phalanx. Nextly the anterior joint is bent by the long flexor drawing the last phalanx towards the sole. And lastly the metatarso-phalangeal joint is flexed by the indirect action of the two tendons bound to the first phalanx by the sheath of the digit, and by the direct contraction of the lumbricalis and interossei muscles.

The *musculus accessorius*, F, is a squarish fleshy mass, which has received its name from assisting the long flexor to bend the digits. It is bifurcated behind, and arises externally by tendon from the outer surface of the os calcis and the long plantar ligament, and internally by a thick fleshy part, G, from the inner concave surface of that bone. About the middle of the sole it becomes ten-

dinous, and ends most commonly by joining the flexor perforans and the slip of the flexor pollicis, so as to assist in forming the tendons for the second, third, and fourth, digits.*

On the muscle rest the external plantar nerve and vessels, and the flexor perforatus ; and under it lie the os calcis and the long plantar ligament. Between the heads of origin of the muscle a piece of the plantar ligament appears.

Supposing the long flexor to act alone the four outer toes would be bent somewhat under each other ; but when the accessorius contracts it opposes that oblique inward movement of the digits, and with the help of the flexor perforatus bends the toes directly back.

Lumbricales, H. Four in number, they serve as accessory flexor muscles to the four outer toes ; and are named first, second, &c., from the inner to the outer side of the foot. They take origin behind from the pieces into which the flexor perforans splits, the most internal being fixed commonly to only one, and each of the others to two tendinous slips. Near the metatarso-phalangeal articulation each ends in a tendon, which passes at the tibial side of the toe to join the extensor tendon on the dorsum of the first phalanx : as they bend down by the sides of the joints they are closely attached to the metatarsal phalanx, or are connected with it by a thin tendinous slip.

The muscles decrease in size from the first to the fourth. At the root of the toes they become cutaneous between the processes of the plantar fascia, with the digital nerves and arteries, and they appear there even before the removal of the superficial flexor muscle (Fig. i.).

Contracting with the long flexor these muscles bring towards the sole the metatarsal phalanges, thus serving as flexors of the metatarso-phalangeal joints of the four outer toes.

Plantar arteries. In the second Figure the course of these vessels between the first two strata of muscles may be observed. Of the two the external is the largest, and furnishes most digital

* Professor Turner in the Paper (Trans. of the Roy. Soc. of Edinb.) before referred to.

branches to the toes; but a more complete view of these arteries will be contained in the next Plate. In this Figure the small muscular branches of the internal plantar artery to the inner two lumbricales, and to part of the flexor brevis pollicis are displayed.

Plantar nerves. Two in number like the arteries, there is not the same disparity in size between them, for though one supplies most digits the other gives most offsets to muscles. They are placed with the bloodvessels between the first two muscular strata. The distribution of the internal nerve to three digits and a half and a few muscles has been given at p. 439; and the arrangement of the external nerve, which is furnished to one digit and a half and many muscles, will be afterwards considered.

DESCRIPTION OF PLATE LVII.

IN this Plate the last two stages of the dissection of the foot are delineated.

FIGURE I.

Part of the external plantar vessels and nerve, with their branches, and the short muscles of the great and the little toe are represented in this Figure.

After making the preparation of the parts illustrated in Fig. II. of the foregoing Plate, the dissection of the third stage will be completed by dividing the accessorius muscle and the tendons of the flexors of the digits about two inches in front of the heel; and by removing the areolar tissue from the muscles, vessels, and nerves, after the flexor perforans with its lumbricales has been thrown forwards to the toes. Whilst the flexor tendon is being raised, the small nerves and arteries to the outer two lumbricales muscles are to be sought with care.

MUSCLES OF THE THIRD LAYER.

This stratum consists chiefly of the short muscles of the first and fifth digits, which reach scarcely farther back than the metatarsal bones: they are the short flexor and adductor of the great toe, the short flexor of the little toe, and a fourth muscle (transversalis pedis) which crosses the heads of the metatarsal bones.

N. Flexor brevis pollicis.
O. Flexor brevis minimi digiti.
Q. Peroneus longus.
R. Adductor pollicis.

S. Transversalis pedis.
T. Part of the tendon of the tibialis posticus.
U. Long plantar ligament.

The *flexor brevis pollicis*, N, the most internal muscle of the set, is pointed and tendinous behind, but is split anteriorly into two pieces or heads. Its tendon is attached posteriorly to the cuboid bone, and blends with the prolongation, T, from the tendon of the tibialis posticus to the outer cuneiform bone. Towards the front of the metatarsal bone it is divided into two heads, and these are inserted into the base of the first phalanx,—the inner joining the *abductor pollicis*, A, and the outer blending with the adductor, R.

Superficial to the muscle is the tendon of the long flexor; and underneath it lie the deep vessels of the foot. In each head of insertion a sesamoid bone is contained.

The muscle draws towards the sole the metatarsal phalanx, to which the long flexor tendon is not attached, and thus bends the metatarso-phalangeal joint of the great toe.

The *adductor pollicis*, R, arises behind from the sheath of the peroneus longus tendon, Q, and from the bases of the second, third, and fourth, metatarsal bones. In front it joins the outer head of the flexor brevis pollicis, and is inserted into the outer side of the first phalanx of the great toe.

It is concealed by the flexor perforans and the lumbricales; it covers some of the interossei, and the external plantar vessels and nerve. United with it at the insertion is the transversalis pedis.

Acting with the transversalis pedis the muscle will adduct the great toe to the others; and in concert with the short flexor and abductor it will bend the metatarso-phalangeal joint.

Transversalis pedis, S. This is a thin fleshy slip, which lies across the heads of the metatarsal bones. It arises by bundles of fibres from the capsule of the metatarso-phalangeal articulations of the fourth, third, and second, toes (sometimes the fifth); and from the fascia covering the interossei muscles. Internally it is inserted with the adductor into the nearest phalanx of the great toe.

By its cutaneous surface it is in contact with the flexor perforans, the lumbricales, and the digital nerves; and by the deep, it touches the interossei and the digital vessels. The muscle is described by Theile as a short head of the adductor pollicis.

From its position and attachment to the four inner toes it will approximate them to one another.

The *flexor brevis minimi digiti*, O, lies on the metatarsal bone of the little toe, and resembles the interossei. Posteriorly it arises from the base of the fifth metatarsal bone, and from the sheath of the peroneus longus tendon; and it is inserted anteriorly into the base of the first phalanx after blending with the capsule of the metatarso-phalangeal articulation, and into the fore part of the metatarsal bone (Theile).

As the name signifies the muscle may be used as a flexor of the metatarso-phalangeal joint; but it may draw down slightly the outer border of the foot in consequence of its attachment to the metatarsal bone.

EXTERNAL PLANTAR NERVE.

As far as the root of the little toe the external plantar with its digital offsets was shown in the preceding Plate, and the remainder or the deep part of the nerve is represented in this view.

2. Internal plantar nerve, cut.
3. External plantar nerve.
4. Superficial or digital part of external plantar.

5. Deep part of external plantar.
6. Branch to transversalis pedis.
- †† Branches to outer two lumbricales.

Base of 5th
Y Sheath of

The *deep part* of the *external plantar nerve*, 5, is directed inwards beneath the flexor perforans and the lubricales, and ends in branches for the adductor pollicis, R. In this course it accompanies the external plantar artery, and distributes offsets to the neighbouring muscles of the third and fourth strata, which are referred to below :—

To the under surface of the adductor pollicis two or three branches (the terminal pieces of the nerve) are distributed : one is shown piercing the outer border.

A slender branch, 6, enters the transversalis pedis : in this foot it was divided into two.

For each of the outer two lumbricales there is a small branch of nerve, †, which enters the under surface with an arterial offset. Commonly these branches are destroyed as the long flexor muscle is raised.

All the interossei receive branches from the external plantar, but these are more fully illustrated in Fig. ii.

In its distribution in the foot this nerve resembles closely the ulnar nerve in the hand. Like its representative in the other member it gives many muscular and but few digital branches. Thus it supplies one digit and a half, and the teguments of that border of the foot which is in a line with the smallest digit. Like the ulnar too it furnishes branches to all the muscles of the small digit, and to the adductor of the large digit ; and in the same way as that nerve it sends offsets to the outer two lumbricales and to all the interossei.

Differences in the distribution of the two nerves are due to a want of similarity in the muscles of the first and fifth digits, and to the existence of some special muscles in each member. For instance the opponens or adductor minimi digiti is present in the hand but not in the foot, and will have a separate branch from the ulnar. The short flexor of the thumb is a less simple muscle than that of the great toe, and is supplied in part (inner head) by the ulnar ; whilst the external plantar does not reach the homologous muscle in the foot.

One special muscle in the hand (palmaris brevis) is supplied by the ulnar ; and two special muscles in the foot (accessorius and

transversalis pedis) obtain their nerves from the external plantar.

The *external plantar artery, c*, crosses the sole of the foot with its nerve, to form the plantar arch. Digital and muscular branches arise from the arch: the former of these and the trunk will be delineated in Fig. ii.; and the latter, which enter the neighbouring muscles, are visible in this stage.

Each of the two external lumbricales receives an arterial twig; and there is sometimes another branch for the second lumbricalis muscle, as in this dissection.

The transversalis pedis is supplied on the under surface by one or more of the subjacent digital arteries.

For the interossei of the three outer spaces offsets are derived from the digital arteries and the arch (Fig. ii.).

Branches to the adductor pollicis penetrate the fibres at the under surface, like the nerves.

From the most external digital artery proceed branches for the flexor brevis minimi digiti.

Veins. The companion veins of the plantar arch and its branches were purposely removed in the dissection, to render the Figure less complicated.

FIGURE II.

The fourth stage of the dissection of the foot is depicted in this Figure.

By cutting across and removing the adductor and part of the flexor brevis pollicis the plantar arch will be laid bare; and by removing the transversalis pedis and the transverse metatarsal ligament beneath it, and passing the scalpel backwards for a short distance in the centre of the three outer intermetatarsal spaces the interossei muscles will be defined. On the removal of some areolar tissue from the hinder part of the sole, the insertion of the tibialis posticus, the tendon of the peroneus longus, some ligaments of the foot, and small deep anastomotic vessels come into sight.

MUSCLES OF THE FOURTH LAYER.

In the last layer of the sole of the foot are included the interossei, and the tendons of insertion of the tibialis posticus and peroneus longus. When the same letters are used in the Figures they point to the same parts.

M.	} Prolongations of the tendon of the tibialis posticus at its insertion.		X. Three plantar interossei.
V.			Z. Four dorsal interossei.
W.			
Y.			

The *interossei muscles* are seven in number, and fill the interval between the metatarsal bones. Two are lodged in each intermetatarsal space, except in the inner where there is only one and they are attached to the bones bounding laterally the spaces they are arranged into a plantar and a dorsal set.

The *plantar set*, X, three in number, are slender fleshy slip which lie in the three outer spaces, and arise each from a single metatarsal bone, viz., fifth, fourth, and third. Opposite the metatarso-phalangeal joint each becomes tendinous, and is inserted into the inner side of the base of the first phalanx of its toe; slip is prolonged from it to join the extensor tendons on the dorsum of the phalanx.

The *dorsal set*, Z, are four in number, one being placed in each of the intermetatarsal spaces. Each has a double origin lateral from the two metatarsal bones between which it is lodged. Anteriorly they end in tendons, which are inserted, like the plantar muscles, into the fibular side of the fourth and third toes, and in both sides of the second toe: they join also the extensor tendons on the dorsum.

All the muscles are visible in the sole of the foot, where they are covered by fascia, by the external plantar nerve, and the plantar arch and its branches: near the toes the transverses pedis and the transverse metatarsal ligament lie on them. On the dorsum of the foot only the dorsal set appear; and they are pierced behind by arteries passing from the one aspect of the foot to the other.

The chief office of these muscles is to approximate the four outer toes towards, or to remove them from the great toe ; and they act therefore as abductors and adductors of those digits to the inner one. For instance the three plantar and the innermost dorsal muscle adduct the four smaller to the larger toe ; and the remaining three muscles of the dorsal set will move the second, third, and fourth, toes away from that digit, so as to become abductors.

When the four outer toes are being bent by the action of the flexors the interossei will help in the completion of the movement ; and when the digits have been extended these muscles will serve to fix the first phalanges against the metatarsal bones.

Tendon of the peroneus longus, Q. The fleshy belly of the muscle in the leg is delineated in the following Plate ; and only part of the course of its tendon, and the insertion, appear in this Figure. As now seen, the tendon winds round the outer surface of the os calcis to cross the foot from the outer to the inner side. At first it is received into a groove in the cuboid bone, and is then continued forwards to be inserted into the base of the metatarsal bone of the great toe, and into the fore part of the internal cuneiform bone ; sometimes also by a slip into the base of the second metatarsal bone.

As the tendon crosses the sole it is contained in a sheath which is formed towards the outer part by the long plantar ligament, U, and the cuboid bone, and at the inner part by areolar tissue ; and its motion in the sheath is facilitated by a synovial sac which extends to the insertion. On the outer aspect of the cuboid bone the tendon becomes flattened and thickened, and at that spot it contains either fibro-cartilage or a sesamoid bone.

Insertion of the tibialis posticus, T. Arising at the back of the leg (Plate LV.) its tendon passes along the inner side of the foot, supporting the articulation between the astragalus and scaphoid bone, and is inserted into the tubercle on the inner and under part of the os scaphoides. From the insertion processes are continued to several of the tarsal and metatarsal bones :—one, X, reaches the internal cuneiform ; another, Y, is attached to the middle cuneiform and the second metatarsal ; a third, W, is pro-

longed to the external cuneiform, the cuboid, and the third and fourth metatarsal bones ; and a fourth, M, is reflected backwards to be fixed into the os calcis. In short, the tendon is attached to all the tarsal bones except the astragalus ; and to the metatarsal bones with the exception of those of the great and the little toe.

DEEP VESSELS OF THE SOLE.

Both tibial vessels end in the sole of the foot—the anterior passing through the first interosseous space, and the posterior entering at the inner side of the heel ; and both furnish digital arteries to the toes.

- | | |
|--|---|
| <p><i>c.</i> External plantar trunk.</p> <p><i>d.</i> Digital branch of outside of little toe.</p> <p><i>e.</i> Digital branch of inside of great toe.</p> <p><i>f.</i> Digital branch of first and second toes.</p> <p><i>g.</i> Digital branch of second and third toes.</p> | <p><i>h.</i> Digital branch of third and fourth toes.</p> <p><i>i.</i> Digital branch of fourth and fifth toes.</p> <p><i>l.</i> Dorsal artery of the foot.</p> <p><i>n.</i> Artery of the great toe.</p> <p><i>o.</i> Communicating branch to deep arch.</p> |
|--|---|

The *plantar arch* is the curved terminal part of the external plantar artery, *c.* Its extent is limited by the base of the little toe in one direction, and the back of the first interosseous space in the other. Internally it joins the dorsal artery of the foot (anterior tibial) by means of the communicating branch, *o*, so as to establish a direct inosculation between the main vessels on the fore and hinder aspects of the leg. In this course it crosses three of the metatarsal bones near their tarsal ends, and rests on most of the interossei muscles. At the outer part it is covered by the flexor perforans and the lumbricales, and at the inner, by the adductor pollicis.

Companion veins lie on its sides, and the external plantar nerve curves in a similar way just behind it.

From the convexity or anterior part of the arch proceed digital arteries, and from the concavity arise perforating and small nutritive branches.

The *digital branches*, four in number, are furnished to the three outer toes and half the second. Each, except the most external, splits at the cleft of the toes to supply the contiguous sides of two; and at the point of division springs a small branch (*anterior perforating*), which passes downwards to anastomose with the interosseous arteries on the dorsum of the foot. Whilst they lie on the interossei small offsets are emitted to those muscles.

The first branch, *d*, lying on the outside of the small toe, remains single to the end of the digit, and supplies cutaneous branches to the outer part of the foot, like the nerve.

The second, *i*, placed over the fourth interosseous space may communicate with the former by a cross piece (Plate LVII.); it gives an offset to the fourth lumbricalis, and branches for the sides of the fifth and fourth digits.

The third corresponds with the third space, and furnishes offsets to the third lumbricalis and the transversalis pedis: its two terminal pieces belong to the sides of the fourth and third toes.

The fourth may supply the second lumbricalis; and it ends on the sides of the third and second digits.

On the toes the arteries are continued to the extremity, one on each side; and they unite in an arch on the plantar surface of the last phalanx, from which fine branches are sent to the tip of the digit. At the extremity of the second toe the branch derived from the plantar arch anastomoses with the digital branch, *f*, of the dorsal artery of the foot. Whilst the arteries lie on the sides of the digits they furnish superficial offsets forwards and backwards, and communicate beneath the flexor tendons by means of cross branches behind the interphalangeal articulations, as in the fingers.

Three *posterior perforating branches*, *s*, pass down from the arch between the lateral attachments of the dorsal interossei muscles of the outer three spaces, and anastomose with the interosseous arteries on the dorsum of the foot.

Some small *nutritive* and *muscular* branches take their origin from the arch, and from the digital arteries.

The external plantar artery of the foot answers to the ulnar artery of the hand; it resembles that vessel in furnishing digital branches to three toes and a half, and in forming an arch which communicates internally with the other leading vessel of the limb.

But the following marked differences exist in the mode of ending of the two main bloodvessels of the limbs. In the foot there is but one arch in which both tibials are united; and the plantar arch thus formed has a deep position in the sole of the foot, where it lies in contact with the interossei. In the hand on the contrary there are two distinct palmar arches—superficial and deep, which communicate through the intervention of small branches: of these, the former is continuous with the ulnar artery, and the latter with the radial.

On comparing also the muscular offsets of the arterial trunks in the hand and foot considerable dissimilarity will be found, as in the nerves, on account of the want of uniformity in the muscles of the two parts.

Wounds of the plantar arch can take place but seldom in consequence of the vessel being protected by the shoe, and the depth of the soft parts. If it was opened it would bleed freely, as in injury of the palmar arch, from its free inosculation with the anterior tibial artery.

With bleeding from a wound in the foot, such as would lead to the supposition that the arch itself, or one or more of the digital arteries close to their origin from it had been opened, the flow of blood would generally be arrested by pressure applied to the anterior tibial artery on the dorsum of the tarsus, to the posterior tibial between the heel and ankle, and to the wound in the foot by a graduated compress, as in the case of wounds of the palm of the hand. Should considerable recurrent bleeding still take place, ligature of one or both of the tibials may be tried, to cut off the free supply of blood to the foot.

Dorsal artery of the foot, l. This artery is a continuation of the anterior tibial trunk (Plate LVIII.), and furnishes digital branches to one toe and a half. It enters the sole at the back of the first interosseous space, and ends by joining the plantar arch

through the *communicating* part, *o*. From its extremity in the sole of the foot the large artery of the great toe is sent forwards, and one or two small branches run backwards.

The *large artery of the toe*, *n*, (art. mag. pol.) is the digital branch of the anterior tibial, and supplies one toe and a half: it has the following arrangement. It runs forwards over the first interosseous muscle to the cleft of the toes, where it splits into the two collateral branches for the great toe and the next; and near the fore part of the interosseous space a branch is directed inwards under the flexor muscles, or between the heads of the short flexor, to form the digital branch, *e*, of the inner side of the great toe.

The anterior tibial artery in the foot resembles the radial artery in the hand in supplying branches to one digit and a half. But it differs from that vessel in assisting to complete the plantar arch instead of forming, like the radial, a separate arch.

Deep anastomosis of the foot. In the sole of the foot amongst the processes of the tendons and the ligaments is situate a chain of anastomoses between branches of the internal and external plantar with the dorsal artery of the foot, as is shown in the Drawing.

External plantar nerve, 3. In this dissection of the nerve the branches to the interossei are traced out. From the part of the nerve by the side of the plantar arch small muscular offsets are supplied to all the interossei muscles: these are so evident as not to require figures of reference. The remaining muscular branches of this part of the nerve have been described with Fig. i.

DESCRIPTION OF PLATE LVIII.



THE dissection of the front of the leg and dorsum of the foot appears in this Illustration.

In preparing the dissection divide the skin along the centre of the limb, and reflect it to the sides by means of a cross cut at each end, and a third opposite the ankle. After search has been made for the cutaneous nerves and vessels in the fat, the fascia may be taken away to show the muscles and the deeper vessels and nerves; but in executing this step the two parts of the anterior annular ligament are to be defined and left, as in the Plate.

CUTANEOUS VEINS AND ARTERIES.

On the dorsum of the foot is the arch in which the saphenous veins begin. The small arteries ramifying on the surface of the leg and foot are derived from the anterior tibial trunk.

- a.* Venous arch of the foot.
- b.* Internal saphenous.
- c.* External saphenous.

- d.* Communicating veins.
- p.* Venæ comites.

The *venous arch*, *a*, on the dorsum of the foot, answers to a similar arch on the back of the hand. Contained in the subcutaneous fat, it is placed anterior to the tarsus. Its convexity is turned towards the toes, and is joined by small digital veins; and at its concavity open small superficial, with some deep veins, *d*. At each end the arch is continued into a saphenous vein.

The *internal saphenous vein*, *b*, begins at the inner end of the dorsal arch, and ascending to the leg in front of the inner ankle crosses obliquely the tibia: its further course in the leg behind that bone is manifest in Plate LV.

The *external saphenous vein*, *c*, springs from the confluence of

the outer end of the arch with a vein from the outer side of the foot : it soon bends below the outer ankle to the back of the leg, where it is represented in Plate LIII.

Cutaneous arteries. In the leg these are small in size, and are offsets of the anterior tibial, but as they are unnamed no letters of reference have been placed on them. They issue mostly along the borders of the tibialis anticus, and those along the outer side of the muscle mark the position of the subjacent tibial trunk. One larger than the rest, and external to them, pierces the fascia outside the extensor of the toes, B, and runs with the musculo-cutaneous nerve, 3.

On the dorsum of the foot and toes the other small unnamed arteries originate in the dorsal artery of the foot and its branches.

CUTANEOUS NERVES OF THE FRONT OF THE LEG.

On the dorsum of the foot, as on the back of the hand, there is a free distribution of cutaneous nerves ; whilst the teguments on the fore part of the leg, like those on the back of the forearm are but sparingly supplied with nerves.

- | | |
|------------------------|-------------------------------------|
| 1. Internal saphenous. | 4. Cutaneous of external popliteal. |
| 2. External saphenous. | 5. Cutaneous of anterior tibial. |
| 3. Musculo-cutaneous. | |

The *internal saphenous*, 1, courses along the inner side of the leg (Plate LV.), and sends forwards many fine branches to the teguments over the tibialis anticus : the largest of these, near the knee, is marked thus, †. Below the middle of the leg it turns to the fore part of the ankle with the saphenous vein to end in the teguments of the inner side of the instep, reaching about two thirds along the foot. Near the ending it is joined by the musculo-cutaneous ; and some of the terminal filaments sink through the fascia, like the musculo-cutaneous nerve in the forearm, to supply the tarsus.

The *external saphenous*, 2, a branch of the internal popliteal trunk (p. 412), descends along the back of the leg to the heel (Plate LIII.). Bending forwards below the external malleolus, it

runs along the outer border of the foot, and terminates on the outside of the little toe. When in contact with the foot it furnishes nerves to all the outer margin, but the offsets to the sole are larger than those on the dorsum. Oftentimes the nerve is large; then it supplies more digits than usual, and a larger part of the dorsum of the foot.

The *musculo-cutaneous nerve*, 3, is one of the terminal pieces of the external popliteal trunk (p. 423), and takes partly a deep and partly a superficial position in the limb, so as to give branches to muscles and integuments—whence the name. Beginning at the back of the limb, it is directed forwards at first outside the fibula and under the peroneus longus. In front of that bone it is inclined down between the peronei muscles and the extensor longus digitorum; and gradually reaching the surface, it pierces the fascia in the lower third of the leg to end on the dorsum of the foot and toes.

When the nerve is beneath the fascia it furnishes offsets to the peroneus longus and brevis muscles.

After it becomes cutaneous it divides into two pieces, inner and outer, which are continued over the dorsum of the foot to the extremities of the toes, like the radial nerve on the hand. These two branches may vary much in size and in distribution; but commonly they supply dorsal digital nerves to all the toes, except the outer side of the little toe, and the contiguous sides of the great and second toes. Each of the two primary pieces furnishes offsets to its side of the foot, and communicates with the saphenous nerve close to it.

Anterior tibial nerve, 8. At the back of the first interosseous space this nerve becomes cutaneous; and it ends in two dorsal digital nerves for the adjacent sides of the first and second toes. Offsets of it enter the teguments of the first interosseous space; and it is joined by the musculo-cutaneous nerve.

Cutaneous of the external popliteal, 4. Arising from the external popliteal at the back of the limb, and piercing the fascia, it is distributed in the integuments of the fore and outer parts of the leg as low as the spot at which the musculo-cutaneous makes its appearance.

MUSCLES OF THE FRONT OF THE LEG.

Two groups of muscles come into view in this Illustration : an anterior which bends the ankle and extends the toes ; and a lateral for the extension of the ankle.

- | | |
|-------------------------------|------------------------------------|
| A. Tibialis anticus. | I. Peroneus brevis. |
| B. Extensor longus digitorum. | J. Upper part of annular ligament. |
| C. Extensor longus pollicis. | K. Lower part of annular ligament. |
| D. Peroneus tertius. | N. External annular ligament. |
| F. Extensor brevis digitorum. | O. Sheaths for the peronei. |
| H. Peroneus longus. | |

Anterior group of muscles. Between the tibia and fibula are lodged two flexors of the ankle (tibialis and peroneus tertius); and between them are situate the long extensor of the toes and the special extensor of the great toe. On the dorsum of the foot lies the short extensor of the toes.

The *tibialis anticus*, A, is the widest and most internal muscle of the group. Its origin is fixed to the upper half or rather more of the outer surface of the tibia, and to the contiguous part of the interosseous membrane—the membranous attachment reaching rather lower down than the osseous. In the lower third of the leg the muscle acquires a tendon, and passing through a sheath in each part of the annular ligament, is inserted into the inner surface of the internal cuneiform bone, and the base of the metatarsal bone of the great toe.

In contact with the fascia throughout, the muscle is inseparably united with it by an aponeurosis at the upper part. It rests on the tibia and the interosseous membrane, covering the spine of that bone in the lower third of the leg ; and lies over the ankle joint and the tarsus. Its outer border touches the extensor digitorum and extensor pollicis, and is the guide to the anterior tibial vessels. In the annular ligament the tendon is surrounded by a synovial sac which reaches nearly to the insertion.

With the foot free to be moved the muscle will bend the ankle and carry inwards the great toe ; it can also raise the inner border of the foot, drawing inwards this part. The foot being fixed, as

in standing, it will help the *tibialis posticus* to lift the inner margin of the instep, so as to make the outside of the foot the supporting part of the body.

After the advanced foot has reached the ground in walking, the muscle will be able to bring the tibia forwards over the instep; and in stooping and rising it will assist in steadying the bones of the leg.

In deformity of the foot with inversion, and elevation of the inner part of the sole from the ground, the tendon of the *tibialis anticus* is shortened and prominent, and will have to be divided, together with others, before the sole can be brought into its natural position.

The *peroneus tertius*, D, is small, and is generally united with the *extensor longus digitorum*. It arises from the lower fourth or third of the inner surface (anterior part) of the fibula, below the long extensor of the toes, and from the lower end of the interosseous membrane. The tendon varies much in size, like the fleshy part of the muscle, and is transmitted through a sheath in the lower part of the annular ligament with the long extensor, to be inserted by a widened extremity into the upper part of the base of the fifth metatarsal bone.

More or less joined with the long extensor of the toes, it is superficial throughout, and is separated from the *peroneus brevis* behind it by a piece of fascia which is fixed into the fibula. Underneath the muscle lie the lower portion of the fibula, the ankle-joint, and the short extensor of the toes.

When the foot hangs the muscle will be employed as a flexor of the ankle, like the *tibialis*; and it will raise the outer border of the foot. But should the limb be fixed by contact with the ground, the action of the *peroneus tertius* on the leg in walking and stooping will be the same as that of the *tibialis*.

The *extensor longus digitorum*, B, is a thin narrow muscle, which arises from the head and three fourths of the inner surface (anterior part) of the fibula; from the external tuberosity of the tibia, and the contiguous interosseous membrane (about an inch); and from the fascia of the leg. Its tendon below is contained in a sheath in the lower portion of the annular ligament with the

peroneus tertius, and divides into four pieces for insertion into the four outer toes.

On the back of the toes the tendons are arranged like those of the extensor of the fingers. For example, on the first phalanx there is a fibrous expansion, which is not fixed into the subjacent bone, and is formed by pieces of the long and short extensors, and by tendons from the lumbricalis and interossei; but that on the little toe does not receive any contribution from the short extensor. At the front of the metatarsal phalanx the expansion divides into three parts, which are connected with the two remaining phalanges in this manner:—The short central piece is inserted into the base of the middle phalanx; and the two lateral blend into one at the fore part of the middle, and are inserted into the base of the last phalanx. Opposite the two nearest phalangeal joints a fibrous slip descends on each side from the expansion, to blend with the capsule of those articulations.

The muscle lies partly in the leg and partly on the dorsum of the foot; and although not fixed into the nearest phalanx, it is so closely united to that bone by the other tendinous slips joining it, as to be able to extend the metatarso-phalangeal joint. Like the tibialis it is superficial throughout. Along the inner side lie the tibialis and extensor pollicis with the tibial vessels and nerve; and on the outer are situate the two external peronei, but separated by a process of fascia.

If the foot and toes are not fixed the muscle extends the phalangeal joints from root to tip, separating the digits at the same time; and it raises afterwards the foot so as to bend the ankle.

Should the foot rest on the ground with the fibula slanting backwards, that bone can be brought forwards over the foot by this muscle. In stooping and rising it will assist the tibialis.

The *extensor brevis digitorum*, F, occupies the dorsum of the foot, and gives tendons to the four inner toes. Thin and fleshy behind, it arises from the outer surface of the os calcis near the fore part, and from the outer end of the lower piece of the anterior annular ligament. At the back of the metatarsal bones it divides into four fleshy bundles; and from these proceed tendons to join the common expansion on the dorsum of the first phalanx in the

case of three toes, but the tendon of the great toe is inserted separately into the base of the nearest phalanx.

On the instep the muscle is covered by the long extensor and the peroneus tertius; and the inner fleshy belly, larger than the others, is detached from the rest of the muscle for a considerable distance. The tendons blend with those of the long extensor, and are applied to the outer border.

It assists the long extensor in straightening the toes, and directs them somewhat out at the same time.

The *extensor proprius pollicis*, C, is concealed for the most part by the preceding muscle. It takes origin from the middle three fifths of the inner surface (anterior part) of the fibula, and from the interosseous membrane. At the ankle it ends in a tendon, which is contained in a space in the lower piece of the annular ligament, and is thence directed over the inner part of the foot to be inserted into the base of the last phalanx of the great toe.

The part of the muscle in the leg is deeply placed between the extensor longus digitorum and the tibialis; but the tendon on the dorsum of the foot is superficial. The tibial vessels lie inside the extensor as low as the ankle, but afterwards outside it.

As this muscle passes over the ankle, like the extensor of the digits, it has a similar action, viz. first straightening its digit and next bending the ankle. And the slanting limb touching the ground, the extensor of the great toe will help to move the fibula over the foot; or to support that bone in stooping.

The *anterior annular ligament* of the leg is constructed by the deep fascia strengthened by transverse fibres near the ankle-joint. It incases and binds down the tendons of the muscles, and consists of two parts—upper and lower.

The upper piece, J, is placed above the ankle, and is squarer in form than the lower. It is attached laterally to the tibia and fibula, and is continued into the fascia of the leg by the upper and lower edges. In it is one sheath towards the inner side for the tibialis anticus, and this is lined by a synovial sac, which is prolonged on the tendon into the other part of the ligament; whilst the other muscles of the leg pass under it without being contained in sheaths. This band serves the purpose of fixing the

vertical parts of the long muscles to the front of the ankle, so as to render them able to bend that joint.

The lower piece, K, is wide and thin internally but pointed and thick externally, and lies below the level of the ankle on the outer side. Externally it is fixed into the upper surface of the os calcis close to the interosseous ligament, and internally into the tibial malleolus and the plantar fascia; and it blends with the deep fascia by its edges. Three sheaths for tendons are constructed in it; an inner for the tibialis anticus, an outer for the extensor longus digitorum and peroneus tertius, and an intermediate one for the extensor proprius pollicis. A synovial sac lubricates each sheath, and the inner one is continued into the compartment in the upper piece, J, of the ligament. The use of this part is to bind horizontally the tendons of the long extensors to the foot, in order that they may act on the ankle as well as the digits.

LATERAL MUSCLES OF THE LEG.—Two muscles enter into this group; and as they are attached to the fibula they are named peronei.

The *peroneus longus*, H, the highest and most superficial of the two, arises from the outer or anterior surface of the upper half of the fibula, though gradually diminishing in width downwards; from the external border of that bone by thin fleshy fibres, behind the peroneus brevis, as low as the inferior fifth; and from the fascia incasing the muscle. Its long tendon passes through an annular ligament behind the outer malleolus, and through a separate sheath of fibro-cartilage, O, on the outer side of the os calcis to reach its insertion in the sole of the foot (p. 451).

Superficial in the leg it rests on the fibula and the peroneus brevis, concealing altogether this muscle above, but only in part below. By means of the sheath attaching it to the bones the peroneus can move both the ankle joint and the foot. In the sole of the foot it lies deeply, and is received into a third fibrous sheath (Plate LVII. Fig. 2. Q).

The muscle is able, when the foot is unsupported, to extend the ankle, and to raise the outer border of the instep, depressing at the same time the inner edge and the great toe.

The foot being immoveable the peroneus longus will elevate the

outer border, throwing the weight of the body on the inner side; and in rising from stooping it will help to bring back the fibula to a right angle with the foot.

The *peroneus brevis*, I, is attached to the outer or anterior surface of the fibula for the lower two thirds of the shaft—the upper end being pointed and lying inside its fellow; and from the intermuscular septum between it and the anterior muscles of the leg. At the ankle its tendon passes with that of the *peroneus longus* through the external annular ligament, lying next the bone; escaped from this it is received into a sheath, O, on the outer side of the os calcis, above that for the *peroneus longus*; and it is finally inserted by a widened end into the base of the metatarsal bone of the little toe.

In the leg the lower part of this *peroneus* is superficial in front of the other, and its tendon is connected to the fibula and the tarsus by sheaths like those of its companion. Fascia isolates it from the muscles on the front and back of the leg.

This muscle extends the ankle, and moves the foot outwards almost horizontally when the toes are not supported; but when the foot is fixed, as in standing, it will assist the long *peroneus* in raising the outer border from the ground. In rising from stooping it acts on the fibula like the *peroneus longus*.

External annular ligament, N. This is a thin band behind and rather below the fibular malleolus, which is formed by thickened fascia, like the other annular ligaments near the ankle. In front it is attached to the malleolus, and behind to the os calcis. Its upper end joins the fascia of the leg, and the lower is united by a thin fibrous layer to the bands of fibro-cartilage fixing the tendon of the *peronei* to the os calcis. There is but one space in the ligament, and this lodges the two *peronei*; it is lubricated by a synovial sac, which bifurcates inferiorly—a piece being continued with each tendon into the fibro-cartilaginous sheath.

ANTERIOR TIBIAL VESSELS.

The anterior tibial artery with its *venæ comites* extends through the front of the leg to the sole of the foot.

- | | |
|---|---|
| <p><i>e.</i> Cutaneous branch with a nerve.
 <i>f.</i> Offsets of the recurrent branch.
 <i>g.</i> Anterior tibial trunk.
 <i>h.</i> Dorsal artery of the foot.
 <i>i.</i> Internal malleolar branch.</p> | <p><i>j.</i> Anterior peroneal branch.
 <i>k.</i> Tarsal branch.
 <i>l.</i> First dorsal interosseous.
 <i>n.</i> Metatarsal branch.
 <i>o.</i> Three outer interosseous.</p> |
|---|---|

The anterior tibial artery, *g*, is derived from the splitting of the popliteal trunk at the lower edge of the popliteus muscle; and it reaches to the sole of the foot, which it enters through the hinder part of the first interosseous space, ending as before said (p. 454). Beginning at the back of the leg (Plate LV.) it is directed forwards at first between the bones and above the interosseous membrane, and then along the front of the leg and the dorsum of the foot. A line on the surface of the limb from the inner part of the neck of the fibula to the first interosseous space would mark the position of the subjacent vessel. For the purpose of description a division of it into two is commonly made, viz. an upper part called anterior tibial, and a lower, which has been named the dorsal artery of the foot.

In the leg the anterior tibial is deeply placed between the fleshy bellies of the muscles; but it becomes more superficial near the ankle, and is covered finally only by the annular ligament and the teguments. To its inner side nearly all the way is the tibialis anticus; though close to the lower end the extensor proprius pollicis intervenes between the two, having crossed the artery just above the ankle. On the outer side comes first the extensor longus digitorum for about two inches, then the extensor pollicis as far as the ankle, and finally the extensor longus digitorum again at the ending. It rests in the upper two thirds of its course on the interosseous membrane, and in the lower third, on the tibia and the ankle-joint.

Companion veins, *p*, encircle the artery, forming a plexiform disposition over the upper part. The anterior tibial nerve, 6, comes into contact with the vessels about the place of meeting of the upper and middle thirds of the leg, and runs with them to the foot; at first it is external, then internal to the vessels, and finally external in position on the dorsum of the foot.

Branches. Most of the collateral offsets are unnamed, and are

distributed to the neighbouring muscles and the teguments. Even the named branches are small in size, like the offsets of the arteries of the upper limb; they are the following:—

The *recurrent branch* springs from the upper end of the artery, and ascends through the tibialis to the knee-joint: it gives branches to that muscle, and its superficial ramifications are marked with *f*.

A *cutaneous branch, e*, accompanies the musculo-cutaneous nerve: it supplies the contiguous muscles, and ends in the teguments.

Malleolar branches. Two small arteries with this name take origin a little above the ankle, and ramify over the malleoli: the inner is shown by, *i*; and the outer, concealed by the muscles, joins the anterior communicating branch, *j*, of the peroneal artery (p. 432).

Articular branches pass from the lower end of the artery into the ankle-joint.

Peculiarities. Occasionally the trunk of the anterior tibial artery has been found superficial to the muscles in the lower part of the leg; in such a condition of the vessel a superficial wound might lay it open. Its size is very variable, like the arteries of the upper limb, and the deficient part is supplied by an offset from the posterior tibial, or from the peroneal artery.

Dorsal artery of the foot, h. This part of the anterior tibial extends from the ankle-joint to the ending in the sole of the foot. It lies near the surface; and its position will be found by the line before mentioned.

For the greater part of its extent it is covered by the inner piece of the extensor brevis digitorum, but at the beginning and ending only by the special fascia and the teguments. It is firmly supported by the subjacent tarsal bones. Laterally it has a tendon on each side, viz. the extensor pollicis internally, and the extensor longus digitorum externally, but both are at a distance from it—about half an inch.

The venæ comites have the same arrangement here as above, and the anterior tibial nerve is placed on the outer side.

Branches. Many offsets are given to the tarsal and metatarsal portions of the foot: those leaving the inner side of the vessel

are unnamed ; and those on the outer side, which are rather larger, are named tarsal, metatarsal, and interosseous, from their distribution.

The *tarsal branch, k*, arises opposite the scaphoid bone, and is directed beneath the extensor brevis digitorum to the outer part of the tarsus ; it gives branches to that muscle, and anastomoses with the arteries before and behind it, viz. metatarsal, *n*, and anterior communicating of the peroneal, *j*.

The *metatarsal branch, n*, leaves the trunk at the fore part of the tarsus, and runs outwards across the base of the metatarsal bones to the border of the foot, where it anastomoses with the tarsal and external plantar arteries. In its course it lies beneath the short extensor, and forms an arch, from the fore part of which the following small interosseous arteries proceed :—

The *dorsal interossei, o*, of the three outer spaces spring from the metatarsal branch, and run forwards to the cleft of the toes. Here each bifurcates, and the small resulting branches are continued to the end of the toes as the dorsal digital arteries : the most external furnishes also a branch to the outer side of the little toe. From the beginning of each interosseous branch a piece descends to the sole of the foot to unite with the plantar arch ; and from the ending springs another offset to enter a digital artery : these are named anterior and posterior perforating branches (p. 453).

First dorsal interosseous branch, l, arises from the dorsal artery as this is about to sink into the sole : it is continued forwards in the first space, in the same manner as the other arteries, and divides like them for the sides of the first two toes. The space receives offsets from it.

Branch of the peroneal artery, j. The anterior communicating branch of this artery (p. 432) comes through the aperture in the lower part of the interosseous membrane, and descends in front of the outer malleolus to the tarsus, where it distributes many branches : above it anastomoses with the external malleolar, and below with the tarsal artery.

Venæ comites. The anterior tibial veins have the same extent and connections as the artery, and end above in the popliteal

trunk : in their course they receive branches corresponding with those of the artery. They have a plexiform disposition around the tibial bloodvessel, especially above ; and they anastomose with the internal saphenous vein.

Peculiarities. The dorsal artery of the foot is subject to great variations in its position and size. Frequently it forms an arch under the extensor brevis digitorum, with the convexity towards the outer border of the foot. Much bleeding from a wound on the top of the instep, towards the outer part, which would be far out of the usual line of the vessel, would suggest the probability of the artery being opened in its unusual situation.

When the anterior tibial is so small as not to reach to the lower part of the leg the anterior communicating branch of the peroneal becomes the dorsal artery of the foot, and takes the place of the deficient tibial trunk : this substituted vessel may have also the same uncommon curved course on the dorsum of the foot as the anterior tibial.

Ligature. In the dead body the artery is easily reached in consequence of its superficial and fixed position ; and the operation of ligature may be practised on it in the following way :—

First, the position of the vessel is to be ascertained by a line on the surface, from the centre of the ankle to the back of the first interosseous space.

A cut in that line, about two inches in length and nearer the interosseous space than the ankle-joint, is to divide the skin, the teguments, and the deep fascia covering the muscles.

After cutting through the superficial strata the inner piece of the extensor brevis digitorum comes into sight ; and the tendon connected with those fleshy fibres serves as the deep guide to the bloodvessels issuing from beneath. In the bottom of the wound appears the anterior tibial nerve, which is generally outside and close to the artery ; but the tendons of the long extensors of the digits are at some distance from the vessels, and are not visible.

Opening now the arterial sheath, and detaching the venæ comites, the thread is to be passed around, and to be knotted on the vessel in the usual way.

Should the tibial artery have the unusual course on the dorsum

of the foot, which has been above cited (p. 468), no bloodvessels will be met with by the usual incision in the line of the artery ; but if the cut be made to reach the interosseous space, the wandering vessel may be recognised coming to the hinder part of that interval to enter the foot.

Wound of the artery. Considerable bleeding would follow the opening of the artery on the dorsum of the foot on account of the free communication of the anterior with the posterior tibial bloodvessel. For the arrest of the hæmorrhage two plans may be adopted. According to the one, two ligatures may be applied to the vessel, one above, and the other below the opening ; and according to the other, pressure may be made on the trunk of the artery, and to the wound, whilst, if necessary, the flow of blood in the posterior tibial artery may be checked by the employment of a compress to that trunk.

Lymphatics of the leg. Only a summary of these small vessels will here be given, as they are not indicated in the Figure. There are superficial and deep lymphatics with the bloodvessels, as in the upper limb.

In the superficial set are two groups, one with each saphenous vein. The lymphatics with the short saphenous enter the popliteal glands ; and those with the long saphenous vein open into the inguinal glands. Enlargement and inflammation consequent on disease or irritation of the lymphatics on the opposite borders of the foot would affect different glands.

The deep lymphatics run along the main arteries, and all converge to the popliteal glands. In connection with the lymphatics on the anterior tibial artery there is a small gland ; this is the lowest in the limb, and is to be found about half way down the leg.

BRANCHES OF EXTERNAL POPLITEAL NERVE.

The three terminal branches of the external popliteal nerve, viz. recurrent tibial, anterior tibial, and musculo-cutaneous, which begin between the fibula and the peroneus longus, are met with in the dissection of the front of the leg.

- | | |
|-----------------------------|---|
| 5. Recurrent tibial branch. | 7. Branch to short extensor of the toes and the tarsus. |
| 6. Anterior tibial nerve. | 8. Cutaneous part of anterior tibial. |

The *recurrent tibial branch*, 5, passes under the extensor longus digitorum, but over the tibial vessels, to the artery of the same name, and ascends through the tibialis anticus to the knee-joint.

The *anterior tibial nerve*, 6, is directed, like the preceding, beneath the long extensor of the toes, and meets with the tibial vessels above the middle of the leg. From this point it is closely applied to those vessels, crossing them once or more; and continues on the outer side of the dorsal artery of the foot till this bloodvessel enters the sole. Finally it pierces the fascia, and ends in the dorsal teguments of the great toe and the next.

This nerve furnishes offsets to all the muscles of the front of the limb below the knee. It supplies, namely, the two flexors of the ankle (tibialis anticus and peroneus tertius); the common extensors of the toes (ext. digit. longus and brevis); and the special extensor of the great toe (ext. prop. pollicis). To the tarsus it gives a large branch, 7, which resembles much in appearance the nerve distributed to the back of the wrist: from this branch offsets are distributed to the extensor brevis digitorum, which covers it, as well as to the underlying bones and articulations.

The *musculo-cutaneous nerve*, 3, takes a downward course at first between the fibula and the peroneus longus, H, and next, between the peroneus brevis and the extensor longus digitorum, B, to become cutaneous at the lower third of the leg. Its ending on the dorsum of the foot and the toes has been before described (p. 458).

Before the nerve pierces the deep fascia it emits branches as before said to the two lateral peroneal muscles.

INDEX.

- ABDOMEN, 292**
Abdominal aorta, 298
 hernia, 273, 279
 ring, external, 264
 internal, 271, 285
 wall, 261, 284
Abducens nerve, 117, 130
Abductor indicis, 96
 minimi digiti manûs, 95
 pedis, 436
 pollicis manûs, 94
 pedis, 435
Accelerator urinæ muscle, 252
Accessorius muscle, 443
Accessory nerve of obturator, 379
Accessory pudic artery, 327
Acromial thoracic artery, 25
Adductor brevis, 373
 hallucis, 446
 longus, 372
 magnus, 374, 405
 minimi digiti, 95
 pollicis, 94
Anastomosis of arteries
 in the axilla, 26
 at the elbow, 50
 in the foot, 438, 452
 in the hand, 88, 89, 97
 at the knee, 410, 422
 in the thigh, 370, 407
Anastomotie artery of brachial, 50
 of femoral, 363
 branches of profunda, 407
Anconeus muscle, 102
Annular ligament of ankle, anterior, 462
 external, 464
 internal, 425
 of wrist, posterior, 103
Aorta abdominal, 298
Aortic opening, 296
Aperture of diaphragm, 295
 Eustachian tube, 210, 235
 larynx, 212
 nares, 211
 œsophagus, 212
 for vena cava, 296
Aponeurosis of external oblique, 263
Aponeurosis of fascia lata, 261
 femoral artery, 360
 internal oblique, 268
 soft palate, 213
 transversalis, 270
Appendages of uterus, 335
Arch crural or femoral, 284
 diaphragmatic, 295
 palmar, deep, 97
 superficial, 88
 plantar, 452
 palatine, 213
 of subclavian, 167
 of urethra, 326
Arm, dissection of, 40
Artery, anastomotie brachial, 50
 femoral, 363
 aorta, abdominal, 298
 articular azygos, 401, 410
 inferior, 422
 superior, 401, 410
 auricular posterior, 163
 axillary, 6, 21
 brachial, 37, 45
 buccal, 180
 bulbous, 259
 capsular, middle, 299
 carotid, common, 158
 external, 161
 internal, 119, 198
 carpal, ulnar, anterior, 83
 posterior, 105
 radial, anterior, 75
 posterior, 105
 central of the retina, 123
 cervical ascending, 169
 deep, 174
 occipital, 174
 ciliary anterior, 123
 posterior, 123
 circumflex, anterior, 10, 57
 external, 370
 iliac internal, 273, 291
 superficial, 262,
 340
 internal, 376, 395
 posterior, 9, 57, 66

- Artery, coccygeal, 388
 companion of sciatic nerve, 388
 of median nerve, 83
 cremasteric, 273
 crico-thyroid, 198
 dental anterior, 193
 inferior, 179
 posterior, 180, 192
 diaphragmatic, 299
 digital of hand, 89, 97
 of foot, 438, 453
 dorsal of index finger, 105
 of foot, 454, 466
 of penis, 316
 of scapula, 25, 58
 of tongue, 189
 of thumb, 105
 of wrist radial, 75
 ulnar, 105
 epigastric internal, 273, 291
 superficial, 262, 340
 ethmoidal, 123
 facial, 162, 180, 198
 femoral, 358
 frontal, 123
 gluteal, 307, 387, 394
 hæmorrhoidal inferior, 247
 middle, 307
 superior, 329
 hypogastric, 315
 ilio-lumbar, 306
 iliac common, 300
 external, 289, 301
 internal, 300, 305
 infra orbital, 193
 intercostal upper, 170
 lowest, 305
 interosseous anterior, 83, 109
 posterior, 109
 of hand, 97, 105
 of foot, 467
 ischiatic, 247, 307, 388
 labial inferior, 180
 lachrymal, 123
 large of thumb, 97
 of great toe, 455
 laryngeal inferior, 208
 superior, 208
 lingual, 162, 188
 lumbar, 299, 305
 malleolar inner, 466
 outer, 466
 mammary internal, 170
 external, 10
 masseteric, 180
 maxillary internal, 162, 179
 median, 83
 meningeal, large, 119, 179, 183
 small, 183
 metacarpal ulnar, 83
- Artery, metacarpal radial, 105
 metatarsal, 467
 mylo-hyoid, 179
 nasal, 123
 nutritious of femur, 377
 of fibula, 432
 of humerus, 49
 of tibia, 431
 obturator, 292, 307
 occipital, 162, 174
 ophthalmic, 122
 ovarian, 338
 palatine inferior, 198
 palmar deep, 97
 palpebral, 123
 perforating; femoral, 377, 406
 of hand, 97
 of foot, 453
 perinaeal superficial, 253
 peroneal, 431
 anterior, 432, 467
 pharyngeal ascending, 198
 phrenic inferior, 299
 plantar, external, 438, 449
 internal, 437
 popliteal, 407, 421
 profunda cervical, 170, 174
 femoral, 370, 376
 humeral, 49, 65
 pudic external, 262, 339, 363
 internal, 246, 258, 315
 radial, 73, 96
 ranine, 189
 recurrent interosseous, 109
 radial, 75, 110
 tibial, 466
 ulnar, 82, 83
 renal, 299
 sacral, lateral, 306
 middle, 299
 scapular posterior, 142
 sciatic, 247, 307, 388
 spermatic, 299
 subclavian, 138, 167
 sublingual, 189
 submental, 163
 subscapular, 9, 25
 superficial of palm, 75
 supra orbital, 123
 renal, 299
 scapular, 142, 169
 tarsal, 467
 temporal, 162
 deep, 180
 thoracic acromial, 25
 alar, 9, 26
 long, 9, 25
 superior, 25
 thyroid inferior, 169, 197
 superior, 162, 198

- Artery, tibial anterior, 428, 454, 465
 posterior, 428
 tossillitic, 198
 transverse cervical, 142, 169
 facial, 162, 193
 perinaal, 253, 259
 tympenic, 199
 ulnar, 75, 81, 88
 uterine, 337
 vaginal, 338
 vertebral, 119, 169, 174
 vesical inferior, 329
 superior, 329
 Articular popliteal arteries, 410, 422, 423
 nerves, 412, 413
 Articulation of laryngeal cartilages, 221
 Arytænoïd cartilages, 220
 muscle, 227
 Ascending cervical vessels, 169
 pharyngeal vessels, 198
 Auditory nerve, 117
 Auricular artery, posterior, 162
 nerve, large, 145, 165
 posterior, 146
 Auriculo-temporal nerve, 165, 184
 Axilla, 4
 dissection of, 1
 Axillary artery, 6, 21
 glands, 13
 plexus, 11
 sheath, 21
 vein, 10, 26
 Axis, thyroid, 169
 Azygos artery, 410
 uvula muscle, 215
 vein, large, 307
 BASILIC vein, 32, 44
 Biceps femoris, 403
 humeralis, 20
 Bladder connections, male, 322
 female, 332
 ligaments, false, 318, 323
 true, 323
 Blood-letting at elbow, 32
 Brachial aponeurosis, 30, 42
 artery, 45
 plexus, 27, 205
 veins, 44
 Brachialis anticus, 43
 Broad uterine ligament, 334
 Buccal artery, 180
 nerve, 182
 Buccinator muscle, 178
 Bulb of the urethra, 255
 artery of, 258
 nerve of, 260
 CARDIAC nerves, middle, 203
 upper, 203
 Carotid artery, common, 158
 external, 161
 internal, 119, 160, 198
 Carpal arteries, radial, 75, 105
 ulnar, 83
 Cartilage, arytenoid, 220
 cricoid, 219
 cuneiform, 220
 thyroid, 219
 triangular nasal, 235
 Cartilages of nose, 235
 of Santorini, 220
 of trachea, 233
 of Wrisberg, 220
 Cava inferior, 302
 Cavernous sinus, 126
 Central artery of retina, 123
 point of perinaum, 251
 tendon of diaphragm, 294
 Cephalic vein, 27, 32, 44
 Cervical ganglion, inferior, 203
 middle, 203
 superior, 203
 nerves, anterior, 175, 204
 posterior, 175
 plexus, 144, 204
 deep branches, 204
 superficial, 144
 Cervico-facial nerve, 152, 164
 Chiasma of optic nerves, 116
 Chorda tympani nerve, 185
 Chordæ vocales, 223
 Ciliary arteries, 123
 nerves, nasal, 125
 lenticular, 129
 Circular sinus, 126
 Circumflex artery, anterior, 10, 57
 external, 370
 internal, 376
 posterior, 9, 57, 66
 iliac artery, deep, 273, 291
 superficial, 262, 340
 nerve, 12, 58
 Coccygeal artery, 388
 Coccygeus muscle, 313
 Comes nervi ischiadici, 388
 mediani, 83
 Commissure of optic nerves, 116
 Communicating peroneal nerve, 414
 Complexus muscle, 172
 Compression of arteries
 brachial, 45
 femoral, 36
 popliteal, 409
 subclavian, 139
 Congenital hernia, 277
 Conjoined tendon, 271

- Constrictor inferior, 206
 faucium, 215
 middle, 206
 superior, 207
 urethral, 257
 vaginal, 334
 Coraco-brachialis, 3, 20
 clavicular ligament, 16
 Cordiform tendon, 294
 Cords, vocal, 223
 Cornicula laryngis, 220
 Corrugator cutis ani, 243
 Costo-coracoid membrane, 21
 Cowper's glands, 257
 Cranial nerves, 115
 Cremaster muscle, 268
 Cremasteric artery, 273
 Cribriform fascia, 343
 Crico-arytænoid joint, 222
 muscle lateral, 227
 posterior, 227
 thyroid joint, 221
 membrane, 221
 muscle, 228
 Cricoid cartilage, 219
 Crura of the diaphragm, 295
 Crureus muscle, 368
 Crural arch, 284, 344
 deep, 345
 canal, 347
 hernia, 347
 nerve, 309
 ring, 286
 sheath, 286, 345
 Cuneiform cartilages, 220
 articulations of, 222
 Curve of the urethra, 326
 Cutaneous nerves of abdomen, 266
 arm, 81
 buttock, 380
 face, 193
 foot, back, 457
 sole, 439
 hand, palm, 76, 84
 leg, back, 414
 front, 457
 neck, front, 152
 perinæum, 247, 253
 shoulder, 58
 thigh, front, 352
 thorax, 13
 Cutaneous veins of elbow, 30
 DEEP cervical artery, 170, 174
 crural arch, 345
 facial vein, 181
 transverse perinæal muscle, 251,
 257
 Deglutition, act of, 208, 212
 Deltoid muscle, 55
 Dental artery, anterior, 193
 inferior, 179
 posterior, 180, 193
 nerve, anterior, 194
 inferior, 184
 posterior, 194
 Descendens noni nerve, 165, 171
 Depressor epiglottidis, 228
 Diaphragm, 293
 vessels of, 299
 Digastric muscle, 157
 nerve, 164
 Digital arteries, plantar, 438
 radial, 89, 97
 tibial, 467
 ulnar, 89
 nerves of median, 92
 of plantar, 439
 of radial, 76
 of ulnar, 92
 Dissection of abdominal cavity, 293
 wall, 261, 284
 arm, back, 59
 front, 40
 axilla, 1
 axillary vessels, 15
 base of skull, 113
 bend of elbow, 29
 brachial plexus, 15
 buttock, 379
 carotid artery, common,
 153
 external, 153
 internal, 195
 cranial nerves in neck, 195
 femoral hernia, 344
 foot, back, 456
 sole, 424
 forearm, back, 99, 106
 front, 68, 77
 groin, 261
 ham, 397
 hand, back, 99
 palm, 85, 93
 inguinal hernia, 261
 larynx, 218
 leg, back, 413
 front, 456
 lower limb, 339
 lumbar plexus, 304
 neck, back, 172
 front, 131
 neck, anterior triangle, 153
 posterior triangle,
 131
 nose, 233
 orbit, 120, 127
 pelvis, female, 331
 male, 312
 perinæum, back, 241

- Dissection of perinæum, front, 249, 255
 pharynx, 205
 popliteal space, 397
 pterygoid region, 170, 182
 sacral plexus, 304
 saphenous opening, 339
 scapular muscles, 53
 Scarpa's space, 354
 shoulder, 52
 soft palate, 208
 subclavian artery, 166
 submaxillary region, 186
 superior maxillary nerve, 191
 thigh, back, 402
 front, 351
 upper limb, 1
 vena cava inferior, 292
- Dorsal artery of foot, 454, 466
 of tongue, 189
 of scapula, 25, 58
 nerve of penis, 316
- Ductus ad nasum, 237
 Stenonis, 150
 thoracicus, 307
 Whartonii, 188
 Riviniani, 188
- Dura mater of skull, 114, 126
 nerves of, 115
 vessels of, 115
- EIGHTH cranial nerve, 117
- Ejaculator urinæ, 252
- Elbow in dislocation, 60, 71
- Eleventh cranial nerve, 118, 146, 202
- Epigastric artery, deep, 273, 291
 superficial, 262, 340
- Epiglottis, 221
 articulation, 222
 use, 212, 221
- Erector penis, 252
- Ethmoidal arteries, 123
- Eustachian tube, 210, 235
- Extensor carpi radialis brevis, 101
 longus, 101
 carpi ulnaris, 102
 digiti minimi, 102
 digitorum brevis, 461
 communis, 101
 longus pedis, 460
 indicis, 108
 ossis metacarpi, 107
 proprius pollicis, 462
 primi internodii pollicis, 107
 secundi internodii pollicis, 108
- External cutaneous nerve of arm, 40
 of thigh, 309, 352
 mammary artery, 10
 oblique muscle, 263
- External saphenous nerve, 414, 457
- Extravasation of urine, 250, 328
- Eye, arteries, 123
 muscles, 121, 129
 nerves, 125, 129
 veins, 123
- FACIAL artery, 163, 180, 198
 nerve, 117, 164, 194
 vein, 180
- Falciform edge of saphenous opening, 342
- Fallopian tube, 335
- Falx cerebelli, 114
 cerebri, 115
- Fascia, brachial, 30, 42
 cervical, 149
 costo-coracoid, 21
 cremasteric, 274
 cribriform, 343
 forearm, 30
 iliac, 286
 lata, 341
 perinæal, deep, 256
 superficial, 250
 propria, 348
 recto-vesical, 317
 spermatic, 274
 transversalis, 271, 285
- Fat in axilla, 15
 in hollow of elbow, 73
 in ischio-rectal fossa, 245
 in popliteal space, 402
- Femoral artery, 359
 hernia, 344
 ligament, 342
 vein, 364
- Fifth cranial nerve, 116
- Fimbriæ of Fallopian tube, 335
- First cranial nerve, 116, 239
- Fissure for splanchnic nerves, 296
- Flexor minimi digiti, 95
 pedis, 447
 carpi radialis, 69
 ulnaris, 70
 digitorum pedis brevis, 434
 longus, 426
 profundus, 78, 87
 sublimis, 70, 86
 pollicis longus, 77
 pedis, 425
 brevis, 94
 pedis, 446
- Foot, dorsum, 456
 sole, 434
- Forearm, dissection of, 68
 front, deep, 77
 superficial, 68
 back, deep, 106
 superficial, 99

- Fossa ischio-rectal, 245
 Fossæ of abdominal wall, 285
 of base of skull, 113
 Fourth cranial nerve, 116, 124
 Fracture of clavicle, 16
 Frontal artery, 123
 nerve, 125
- GANGLIA** cervical, 203
 lumbar, 311
 sacral, 311
 Ganglion, Gasserian, 117
 lenticular, 129
 ophthalmic, 129
 submaxillary, 190
- Gastrocnemius muscle, 417
 Gemellus inferior, 385
 superior, 385
 Genio-hyo-glossus, 187
 hyoideus, 186
- Genito-crural nerve, 292, 309, 352
 Gimbernat's ligament, 285
 Gland lachrymal, 121
 parotid, 150
 prostatic, 325
 sub-lingual, 151, 188
 submaxillary, 150
- Glands, axillary, 13, 29
 cervical, 155
 Cowper's, 257
 inguinal, 262, 340
 lumbar, 298
 popliteal, 402
 submaxillary, 151, 188
 tracheal, 283
- Glosso-pharyngeal nerve, 118, 190, 200
 Glottis, 224
 Gluteal artery, 307, 387
 nerve, superior, 310, 371, 396
 nerves, inferior, 389
- Gluteus maximus, 381, 403
 medius, 383
 minimus, 391
- Gracilis muscle, 373
 Gustatory artery, 180, 190
 nerve, 184
- HAM**, 398, 416
 Hand, dissection of, 85
 back, 99
 palm, 85, 93
- Hæmorrhoidal arteries, 247, 307, 329
 nerve inferior, 247
 plexus of veins, 329
- Hæmorrhoids, 242
 Hernia, femoral, 344
 its course, 288, 347
 coverings, 288, 348
 diagnosis, 348
 stricture, 288, 349
- Hernia, femoral, operation, 289, 348
 the taxis, 288, 349
 truss, application, 349
- Hernia, inguinal external, 273
 its course, 273
 coverings, 274
 diagnosis, 275
 stricture, 276
 operation, 276
 the taxis, 275
 truss, application, 276
 varieties, 277
- Hernia, inguinal internal, 279
 its course, 279, 283
 coverings, 280, 282
 diagnosis, 280, 282
 stricture, 281, 283
 operation, 281, 283
 taxis, 280, 283
 truss, application, 281, 283
 varieties, 282
- Hernia, obturator, 287
 Hesselbach's space, 279
 Hollow before elbow, 71
 behind knee, 398, 416
- Humerus, fracture of, 57
 Hyo-glossus muscle, 187
 Hyoid bone, 218
 Hypogastric artery, 315
 plexus, 330
- Hypoglossal nerve, 118, 165, 189, 202
- ILIAC** artery, common, 300
 external, 289, 301
 internal, 300
 fascia, 286
 veins, 301
- Iliacus muscle, 297, 374
 Ilio-hypogastric nerve, 267, 269, 309
 inguinal nerve, 267, 269, 309
 lumbar artery, 306
 vertebral ligament, 308
- Indicator muscle, 108
 Infantile hernia, 278
 Inferior maxillary nerve, 182
 Infra-orbital artery, 193
 nerve, 193
 trochlear nerve, 125
- Infra-spinatus muscle, 54
 Inguinal canal, 274
 glands, 262, 340
 hernia, external, 273
 internal, 279
- Innominate artery, 167
 vein, 170
- Intercolumnar fibres, 263
 Intercostal artery, superior, 170
 cutaneous nerves, 13
- Intercosto-humeral nerve, 13, 28
 Internal cutaneous of arm, 28—39

- Internal cutaneous of thigh, 352, 364
 oblique muscle, 268
 saphenous nerve, 353, 364
 vein, 340—354
- Interosseous arteries of foot, 467
 hand, 97
 artery, anterior, 83, 109
 posterior, 109
 muscles of foot, 450
 hand, 95
 nerve, anterior, 84
 posterior, 110
- Ischio-rectal fossa, 245
- Isthmus faucium, 211
 of thyroid body, 232
- JACOBSON'S nerve, 200
- Jugular vein anterior, 152, 170
 external, 143, 164, 170
 internal, 163, 170
- KIDNEY, 293
- LABIAL artery, inferior, 180
- Lachrymal artery, 123
 duct, 237
 gland, 121
 nerve, 124
- Large artery of thumb, 97
 of great toe, 455
- Laryngeal arteries, 208, 231
 nerve, external, 201, 209
 inferior, 201, 230
 superior, 201, 229
 pouch, 225
- Larynx, 223
 aperture, 212
 articulations, 221
 cartilages, 219
 interior, 223
 muscles, 226
 mucous membrane, 225
 nerves, 229
 ventricle, 224
 vessels, 231
- Last dorsal nerve, 269, 303, 310
- Lateral cutaneous nerves of thorax, 13
- Latissimus dorsi, 2, 19, 54
- Lateral sinus, 127
- Leg, dissection of back, 413
 of front, 456
- Lenticular ganglion, 129
- Levator anguli oris, 192
 scapulæ, 53, 133
 ani, 244, 313
 labii superioris, 192
 palati, 214
 palpebræ superioris, 121
 pharyngis, 207
- Ligamenta brevia, 87
- Ligaments of the bladder, 318, 323
 of the larynx, 221
 of the ovary, 336
 of the uterus, 334
- Ligamentum arcuatum inter., 295
 exter., 295
 longum plantæ, 443
 stylo-maxillare, 185
 hyoidean, 187
- Ligature of arteries
 axillary, 7, 23
 brachial, 37, 46
 carotid, common, 158
 external, 162
 internal, 161
 dorsal artery of foot, 468
 femoral, 361
 iliac, common, 300
 external, 290
 internal, 306
 lingual, 162
 popliteal, 409
 radial, 74
 subclavian, third part, 141
 second part, 169
 tibial posterior, 429
 ulnar, 82
- Limb, upper, dissection of, 1
 lower, dissection of, 339
- Linea alba, 263
 semilunaris, 264
- Lingual artery, 162, 188
 vein, 189
- Lithotomy, parts cut, 248, 260, 327
- Longus colli muscle, 197
- Lumbar arteries, 299
 ganglia, 311
 glands, 298
 plexus, 308
 veins, 305
- Lumbo-sacral nerve, 309
- Lumbricales of foot, 444
 hand, 95
- Lymphatic duct, left, 170
 right, 170
- Lymphatics of arm, 52
 axilla, 13
 groin, 340
 ham, 462
 leg, 469
 loins, 298
 neck, 146
- MALLEOLAR arteries, 466
- Mammary artery, external, 10
 internal, 170
- Masseter muscle, 177
- Masseteric artery, 180
 nerve, 182
- Maxillary artery, internal, 163, 179

- Maxillary nerve, inferior, 181
 superior, 193
 Meatuses of the nose, 237
 Median basilic vein, 31
 cephalic vein, 31
 nerve, 51, 76, 91
 vein, 31
 Membranous part of urethra, 255
 Meningeal vessels, 119, 179, 183
 nerves, 115
 veins, 120
 Mesenteric artery, inferior, 299
 superior, 299
 vein, inferior, 302
 superior, 302
 Meso-rectum, 321
 Metacarpal artery, 83
 Metatarsal artery, 467
 Motor oculi nerve, 116, 124, 130
 Movement of radius, 79
 Musculo-cutaneous nerve, 28
 of leg, 458, 476
 spiral nerve, 51, 67, 110
 Musculus abductor minimi digiti, 95
 pedis, 436
 indicis, 96
 pollicis, 94
 pedis, 435
 accessorius pedis, 443
 adductor brevis, 373
 hallucis, 446
 minimi digiti, 95
 longus, 372
 magnus, 374, 405
 pollicis, 94
 anconeus, 102
 arytænoideus, 227
 arytæno-epiglottideus infer.,
 229
 azygos uvulæ, 205
 biceps femoralis, 403
 humeralis, 20, 42
 brachialis anticus, 43
 buccinator, 178
 circumflexus palati, 204
 coccygeus, 313
 complexus, 172
 constrictor inferior, 206
 isthmi faucium,
 215
 medius, 206
 superior, 207
 urethræ, 257
 vaginæ, 334
 coraco-brachialis, 3, 20
 corrugator cutis ani, 243
 cremastericus, 268
 crico-arytænoideus lateralis,
 227
 posticus, 227
 Musculus crico-thyroideus, 228
 deltoides, 55
 depressor epiglottidis, 228
 diaphragmatis, 293
 digastricus, 157
 ejaculator urinæ, 252
 erector penis, 252
 extensor carpi radialis longus,
 101
 brevis, 101
 ulnaris, 102
 minimi digiti, 102
 brevis digitorum pe-
 dis, 461
 longus digit. pedis,
 460
 digitorum manûs,
 101
 indicis, 108
 ossis metacarpi pol-
 licis, 107
 hallucis, 462
 primi internodii pol-
 licis, 107
 secundi internod.
 pollicis, 108
 flexor accessorius, 443
 brevis minimi digiti, 95
 pedis,
 447
 carpi radialis, 69
 ulnaris, 70
 digitorum brevis, 434
 digit. longus pedis, 426,
 442
 hallucis brevis, 446
 longus, 425,
 442
 pollicis brevis, 94
 longus, 77
 profundus digit., 78, 86
 sublimis digit., 70, 86
 gastrocnemius, 417
 gemellus inferior, 385
 superior, 385
 genio-hyo-glossus, 187
 hyoideus, 186
 gluteus maximus, 381, 403
 medius, 383
 minimus, 391
 gracilis, 373
 hyo-glossus, 187
 iliacus, 297, 374
 indicator, 108
 infra-spinatus, 54
 interossei manûs, 95
 pedis, 450
 latissimus dorsi, 2, 19, 54
 levator anguli oris, 192
 scapule, 53, 133

Musculus levator ani, 244, 313
labii superioris, 192
alæ nasi, 192
palati, 214
palpebræ, 121
pharyngis exter., 207
inter., 207
uvulæ, 205
longus colli, 197
lumbricales manûs, 95
pedis, 444
massetericus, 177
mylo-hyoideus, 157
obliquus capitis inferior, 173
superior, 173
oculi inferior, 128
superior, 121
obturator externus, 375, 386,
392
internus, 385, 392
omo-hyoideus, 133, 156, 167
opponens minimi digiti, 95
pollicis, 94
orbicularis palpebrarum, 191
urethræ, 258
palato-glossus, 215
pharyngeus, 215
palmaris brevis, 86
longus, 70
pectineus, 372
pectoralis major, 2, 18
minor, 2, 18
peroneus brevis, 464
longus, 451, 463
tertius, 460
plantaris, 419
platysma myoides, 132
popliteus, 424
pronator quadratus, 78
radii teres, 69
psoas magnus, 296, 374
parvus, 297
pterygoideus externus, 178
internus, 177
pyriformis, 313, 384
quadratus femoris, 386
lumborum, 297
rectus capitis anticus major,
196
minor, 196
lateralis, 197
posticus major,
173
minor, 174
femoris, 367
oculi externus, 122, 128
inferior, 128
internus, 128
superior, 122
rhomboideus, major, 53

Musculus rhomboideus minor, 53
salpingo-pharyngeus, 207
sartorius, 356
scalenus anticus, 134, 166
medius, 134
posticus, 134
semi membranosus, 404
spinalis colli, 173
tendinosus, 404
serratus magnus, 3, 18, 135
soleus, 419
splenius capitis, 133
sphincter ani externus, 244
internus, 243
sterno-cleido-mastoideus,
132, 149
hyoideus, 156
thyroideus, 156
stylo-glossus, 187
hyoideus, 156
pharyngeus, 207
subclavius, 19, 167
suberureus, 369
subscapularis, 3, 19
supinator radii brevis, 107
longus, 64,
71, 100
supra-spinatus, 54
temporalis, 177
tensor palati, 204
vaginæ femoris, 366
teres major, 3, 19, 53
minor, 55
thyro-arytænoideus, 228
hyoideus, 156
tibialis anticus, 459
posticus, 426, 451
transversalis pedis, 447
perinæi superf.,
251
profund.,
257
trapezius, 132
triceps extensor femoris, 367
humeri, 43,
56, 59, 64
vastus externus, 367
internus, 368
Mylo-hyoid artery, 179
muscle, 157
nerve, 165
NARES, posterior, 211
Nasal artery, 123
cartilages, 234
duct, 237
fossæ, 234
nerve, 125, 240
Neck, anterior triangle, 153
posterior triangle, 135

Neck, dissection of, 131

Nerve of coccygeus, 330

external sphincter, 330
gemellus and quadratus, 390,

397

superior, 390

latissimus, 28

levator anguli scapulæ, 204

ani, 330

obturator internus, 390

pectineus, 371

pterygoid muscles, 184, 185

rhomboid muscles, 146

serratus magnus, 28, 146

subclavius, 146, 171

tensor vaginæ femoris, 396

teres major, 28

minor, 58

vasti muscles, 365, 371

Nervus abducens oculi, 117, 130

accessorius obturator, 379

spinalis, 118, 146,
202

auditorius, 117

auricularis magnus, 145, 165

posterior, 146, 164

auriculo-temporalis, 165, 184

buccinatorius, 183

buccalis, 183

cardiaci, 201

cardiacus infer., 204

medius, 203

super., 203

cervicales, 175, 204

cervicalis superficialis, 145, 152

tympanicus, 200

ciliares, 125, 129

circumflexus, 12, 58

communicans peronei, 413

cruralis, 309, 364

cutaneus externus brachii, 28,
40

femoris, 309,

352

cutaneus internus major, 28, 39,
minor, 28, 39

femoris, 352,

364

medius femoris, 352

palmaris, 84

plantaris, 432, 439

dentalis anterior, 194

inferior, 184

posterior, 194

descendens noni, 165, 171

diaphragmaticus, 171

diagasticus, 164

digitales, median., 92

plantar., 439, 440

radial., 76

Nervus digitales, ulnar., 92

dorsales, 267

dorsalis penis, 316

ulnaris, 93

facialis, 117, 164, 194

frontalis, 125

genito-cruralis, 292, 309, 352

glosso-pharyngeus, 118, 190, 200

gluteus inferior, 389

superior, 310, 371, 396

gustatorius, 184, 190

hæmorrhoidalis inferior, 247

hypoglossus, 118, 165, 189, 202

ilio hypogastricus, 267, 269, 309

inguinalis, 267, 269, 309

infra-orbitalis, 195

maxillaris, 152

trochlearis, 125

intercosto-cutanei, 13

interosseus anticus, 84

posticus, 110

ischiadicus major, 390, 411

minor, 248, 380, 389

lachrymalis, 124

laryngeus externus, 201, 209

inferior, 201, 230

superior, 201, 229

lumbales, 308, 380

lumbo-sacralis, 309

massetericus, 182

maxillaris inferior, 182

superior, 193

medianus, 51, 76, 84, 91

meningeales, 115

motor oculi, 116, 124, 130

musculo-cutaneus brachii, 28,
40

cruris, 458,

470

spinalis, 51, 67, 110

mylo-hyoideus, 165

nasalis, 125, 240

obturatorius, 309, 353, 378, 413

occipitalis major, 176

minor, 145, 176

olfactorius, 116, 239

ophthalmicus, 124

opticus, 116, 129

orbitalis, 194

palmaris cutaneus med., 76

ulnar., 84

patellaris, 353, 365

perforans Casserii, 28

perinaëlis superficialis, 247,
254

peronealis communis, 414

petrosus magnus, 118

pharyngeus, 201

phrenicus, 171, 205, 303

plantaris externus, 440, 447, 455,

- Nervus plantaris internus, 439
 pneumo-gastricus, 118, 172, 200
 popliteus externus, 401, 412, 422
 internus, 400, 411, 422
 pudendus inferior, 254, 389
 pudicus internus, 247, 259, 316
 radialis, 76
 recurrens vagi, 201, 230
 articularis, 470
 sacrales, 310
 posteriores, 396
 saphenus externus, 414, 457
 internus, 353, 364, 414, 457
 sciaticus magnus, 390, 411
 parvus, 248, 380, 389, 414
 spheno-palatinus, 194, 239
 splanchnicus major, 311
 minor, 312
 stylo-hyoideus, 164
 suboccipitalis ram. ant., 204
 post., 175
 subscapularis, 28
 supra-orbitalis, 124
 scapularis, 146, 171
 trochlearis, 125
 sympatheticus abdominis, 311
 cervicis, 203
 pelvis, 311, 330
 temporalis profundus, 183
 temporo-facialis, 164
 thoracici anteriores, 27
 thoracicus posterior, 28, 146
 thyro-hyoideus, 165
 tibialis anticus, 458, 470
 posticus, 432
 trigeminus, 116
 trochlearis, 116, 124
 tympanicus, 200
 ulnaris, 51, 84, 92, 98
 uterini, 388
 vaginales, 388
 12th cranial nerve, 118, 200
 13th cartilages, 234
 cavity, 234
 meatuses, 237
 mucous membrane, 238
 nerves, 239
 vessels, 239
 14th stril, 235
 15th trititious artery, femoral, 377
 fibular, 432
 humeral, 49
 tibial, 431
 Obliquus abdominis externus, 263
 Obliquus abdominis internus, 268
 capitis, inferior, 173
 superior, 173
 oculi, inferior, 128
 superior, 121
 Obturator artery, 307
 muscle, external, 375, 386, 392
 internal, 385, 392
 nerve, 309, 353, 378, 413
 Occipital artery, 163, 174
 sinus, 127
 nerve, large, 176
 small, 145, 176
 Oesophageal opening of diaphragm, 295
 Oesophagus, aperture of, 212
 Olecranon, fracture of, 60, 71
 Olfactory nerve, 116, 239
 region, 239
 Omo-hyoid muscle, 133, 156, 167
 Ophthalmic artery, 122
 ganglion, 129
 nerve, 124
 vein, 123
 Opponens pollicis muscle, 94
 Optic commissure, 116
 nerve, 116, 129
 Orbicularis palpebrarum, 191
 urethrae, 258
 Orbit, dissection of, 120, 127
 muscles, 120, 127
 nerves, 123
 vessels, 122
 Orbital branch of nerve, 131, 194
 Os hyoides, 218
 tinea, 333
 Ovaries, 336
 artery, 338
 nerves, 338
 PALATE, soft, 213
 use of, 216
 Palatine arteries, 198
 Palato-glossus, 215
 pharyngeus, 215
 Palm of the hand, 85
 dissection, 85
 cutaneous nerves, 84
 Palmar arch, deep, 97
 superficial, 88
 Palmaris brevis, 86
 longus, 70
 Parotid gland, 150
 Patella branch, 353
 plexus, 353
 Pectineus muscle, 372
 Pectoralis major, 2, 18
 minor, 2, 18
 Peculiarities in arteries
 axillary, 7

Peculiarities in arteries

- brachial, 38, 48
- dorsal artery of foot, 468
- femoral, 361
- iliac, common, 300
 - external, 291
 - internal, 306
- profunda femoral, 361
- popliteal, 409
- radial in forearm, 34, 74, 105
- subclavian, 140
- tibial anter., 466
 - poster., 432
- ulnar in forearm, 34
 - in palm, 90

Pelvis, female, 331
dissection, 331

male, 312

Pelvic fascia, 317
plexus, 330

Perforating arteries, femoral, 377, 406
interosseous, 109
palmar, 97
plantar, 453

Perforans Casserii nerve, 28, 40

Perinæum, male, 241

Perinæal fascia, deep, 256
superficial, 250
nerves, 247, 254

Peritoneal process, with cord, 272

Peritoneum of hernia, 272
of pelvis, male, 323
female, 334

Peroneal artery, 431
anterior, 432, 467
communicating nerve, 414

Peroneus brevis, 464
longus, 451, 463
tertius, 460

Petrosal nerve, large, 118
sinuses, 126

Pharynx, dissection, 205
interior, 209
muscles, 206
openings, 210

Pharyngeal ascending artery, 198
nerve, 201

Phrenic nerve, 171, 205, 303

Piles, 242

Pillars of abdominal ring, 264
of diaphragm, 295
of soft palate, 213

Pituitary membrane, 238

Plantar arteries, 437, 449, 452
ligament, long, 443
nerves, 438, 447, 455

Plate

1. The axilla
2. The axillary vessels

Plate

3. The cutaneous vessels of forearm
4. The brachial vessels
5. The shoulder and scapula
6. The arm, back
7. The spiral nerve and vessels
8. The forearm, front
9. The forearm, deep view
10. The palm of hand, superficial and deep views
11. The forearm, back
12. The forearm, deep view
13. The base of skull and orbit, superficial view
14. The base of skull and orbit, deep view
15. The neck, posterior triangle
16. The neck, surface view
17. The neck, anterior triangle
18. The subclavian vessels
19. The neck, view behind
20. The pterygoid region
21. The pterygoid, deep view
22. The submaxillary region
23. The upper maxillary nerve
24. The internal carotid artery
25. The pharynx, surface view
26. The pharynx, interior
27. The larynx and vocal apparatus
28. The nose cavity
29. The perinæum, anal half
30. The perinæum, anterior half
31. The perinæum, triangular ligament
32. The groin, surface view
33. The groin, deep view
34. The groin, deep part
35. The groin, inner view
36. The abdomen, deep vessels
37. The lumbar and sacral plexuses
38. The pelvis, side muscles
39. The pelvis, recto-vesical fascia
40. The pelvis, the viscera
41. The pelvis, female, side view, viscera
42. The groin, vessels of
43. The groin, crural sheath
44. The thigh, surface view
45. The thigh, femoral vessels
46. The thigh, extensor muscles
47. The thigh, adductor muscles
48. The buttock, surface view
49. The buttock, second stage
50. The buttock, third stage
51. The popliteal space
52. The thigh, back, deep view
53. The leg, back, surface view
54. The leg, back, soleus and plantaris
55. The leg, back, deep view
56. The sole of foot, two superf. views
57. The sole of foot, two deep views
58. The leg, fore part

- Plantar vessels, 437, 449, 452
 nerves, 439, 447, 455
 Plantaris muscle, 419
 Platysma myoides, 132
 Flexus brachial, 27, 171, 205
 cervical, 144, 204
 lumbar, 308
 pelvic, 330, 338
 pharyngeal, 201
 sacral, 310
 Plugging the nares, 236
 Pneumo-gastric nerve, 118, 172, 200
 Pomum Adami, 219
 Popliteal artery, 407, 421
 glands, 402
 nerves, 401, 411, 423
 space, 398, 416
 vein, 400
 Popliteus muscle, 424
 Portio dura, 117
 mollis, 117
 Posterior triangle of neck, 135
 Poupart's ligament, 264
 Pouch laryngeal, 225
 Profunda artery, arm, 49
 neck, 174
 thigh, 363, 370, 376
 branches, 406
 Pronator quadratus, 78
 radii teres, 69
 Prostate gland, 325
 connections, 325
 sheath, 318
 structure, 326
 Prostatic part of urethra, 256
 Psoas magnus, 296, 374
 parvus, 297
 Pterygoid arteries, 180
 nerves, 184, 185
 Pterygoideus externus, 178
 internus, 177
 Pterygo-maxillary region, 176
 Pudendal nerve, inferior, 254, 389
 Pudic artery superficial, 262, 399, 363
 deep, 246, 258, 315
 nerve, 247, 259
 Puncturing bladder, 321
 Pyramid of thyroid body, 232
 Pyriformis muscle, 313, 384
 QUADRATUS femoris, 386
 lumborum, 297
 RADIAL artery, 73, 96, 104
 nerve, 76
 veins, 74
 Radius, fracture, 79
 movement 79
 Ranine artery, 189
 Receptaculum chyli, 307
 Recto-uterine pouch, 335
 Recto-vesical fascia, 317
 pouch, 324
 Rectus-capitis anticus major, 196
 minor, 196
 posticus major, 173
 minor, 174
 lateralis, 197
 femoris, 367
 oculi externus, 122, 128
 inferior, 128
 internus, 128
 superior, 122
 Rectum connections, male, 242, 321
 female, 331
 sheath, 318
 Recurrent interosseous artery, 109
 radial, 75, 109
 tibial, 466
 ulnar anterior, 83
 posterior, 82
 nerve, 201, 230
 tibial branch, 470
 Renal artery, 299
 vein, 302
 Rhomboideus major, 53
 minor, 55
 Rima glottidis, 224
 Ring, abdominal external, 264
 internal, 271, 285
 crural, 286
 Round ligament of uterus, 335
 SACCULUS laryngis, 225
 Sacral artery lateral, 306
 middle, 299
 ganglia, 311
 nerves, 310
 posterior, 396
 plexus, 310
 Sacro-sciatic ligaments, 393
 notches, 393
 Salpingo-pharyngeus, 207
 Saphenous nerve external, 414, 457
 internal, 353, 414, 457
 opening, 342
 vein external, 416, 456
 internal, 340, 354, 456
 Sartorius muscle, 356
 Scaleni muscles, 134, 166
 Scapular artery, posterior, 142
 muscles, 19, 53
 Scarpa's triangular space, 254
 Schneiderian membrane, 238
 Sciatic artery, 247, 307
 nerve large, 390, 411, 414
 small, 380, 389
 Second cranial nerve, 116, 129
 Semi-membranosus muscle, 404
 spinalis colli, 173
 tendinosus muscle, 404

- Septum crurale, 287, 347
 nasi, 235
 Serratus magnus muscle, 3, 18, 135
 Seventh cranial nerve, 117
 Sheath, axillary, 21
 crural, 286, 345
 digital of fingers, 87
 of toes, 443
 Sinuses of the skull, 126
 Sixth cranial nerve, 117
 Soft palate, 213
 use of, 216
 Sole of foot, dissection of, 434
 Soleus muscle, 419
 Spermatic artery, 299
 cord, 266, 272
 fascia, 274
 vein, 392
 Spheno-palatine nerves, 194, 240
 Sphincter ani externus, 244
 internus, 243
 vaginae, 334
 Spinal accessory nerve, 118, 146, 202
 Splanchnic nerves, 311
 Splenius capitis, 133
 Spongy bones, 236
 Spongy part of urethra, 255
 Stenson's duct, 150
 Sterno-cleido mastoideus, 132, 149
 hyoideus, 156
 thyroideus, 156
 Straight sinus, 127
 Stylo-hyoid ligament, 187
 hyoideus, 156
 glossus, 187
 maxillary ligament, 185
 pharyngeus, 207
 Subanconeus muscle, 64
 Subclavian artery, 138, 167
 vein, 170
 Subclavius muscle, 19, 167
 Subcrureus muscle, 369
 Sublingual artery, 189
 gland, 151, 188
 Submaxillary ganglion, 190
 gland, 150, 188
 region, 186
 Submental vessels, 163
 Suboccipital nerve, ant. branch, 204
 post. branch, 175
 Subperitoneal fat, 272
 Subscapular nerve, 28
 vessels, 9
 Subpubic aperture, 287
 Subscapularis muscle, 3, 19
 Superficial fascia, abdominal, 261
 perineal, 250
 femoral, 261, 342
 Superficial cervical artery, 142
 nerve, 145, 152
 Superficial perineal fascia, 520
 volar artery, 75
 Supinator radii brevis, 107
 longus, 64, 71, 100
 Supra-orbital artery, 123
 nerve, 124
 renal capsule, 293
 vessels, 299, 302
 Scapular artery, 142, 169
 nerve, 146, 172
 vein, 170
 spinatus muscle, 54
 trochlear nerve, 125
 Sympathetic cord, abdominal, 311
 cervical, 203
 pelvic, 311, 330
 TARSAL artery, 467
 Temporal arteries, 163, 180
 muscle, 177
 nerve, 182
 Temporo-facial nerve, 164
 Tendo-Achillis, 420
 rupture, 420
 Tendon of extensor cruris, 369
 Tensor palati, 214
 vaginae femoris, 366
 Tenth cranial nerve, 118, 200
 Tentorium cerebelli, 114
 Teres major muscle, 3, 53
 minor muscle, 55
 Thigh, dissection of, 351
 Third cranial nerve, 116, 124, 129
 Thoracic duct, 307
 nerve posterior, 146
 Thoracic acromial artery, 25
 alar, 9, 26
 humeral, 25
 long, 9, 25
 superior, 25
 Thyro-arytænoïd articulations, 223
 muscle, 228
 epiglottid ligament, 222
 hyoid membrane, 222
 muscle, 156
 nerve, 165
 Thyroid artery inferior, 169, 197, 232
 superior, 162, 198, 232
 axis, 169
 body, 232
 cartilage, 219
 veins, 232
 Tibial artery, anterior, 428, 454, 465
 posterior, 428
 nerve, anterior, 428, 470
 posterior, 428, 432
 veins, anterior, 467
 posterior, 428
 Tibialis anticus muscle, 459
 posticus 426, 451

- Tonsil, 213
 artery of, 198
 Torcular Herophili, 127
 Trachea, connections, 233
 structure, 233
 Transverse cervical artery, 142, 169
 vein, 170
 ligament pedal, 436
 perinaal artery, 253
 sinus, 126
 Transversalis abdominis, 270
 fascia, 271
 Transversus pedis muscle, 447
 perinæi superf., 251
 deep, 257
 Trapezius muscle, 132
 Triangle of neck, anterior, 153
 posterior, 135
 Triangular cartilage, nasal, 235
 ligament of urethra, 256,
 314
 space of groin, 279
 of thigh, 354
 of perinæum, 252
 Triceps extensor cruris, 367
 cubiti, 56, 59, 64
 Trigeminal cranial nerve, 116
 Trochlea, 121
 Trochlear nerve, infra, 125
 supra, 125
 Turbinate bones, 236
 Twelfth cranial nerve, 118, 189, 202
 Tympanic artery, 198
- ULNAR artery, 75, 81
 nerve, 51, 84, 92, 98
 veins, deep, 81
 superficial, 31
 Ureter, 323, 332
 Urethra, female, 332
 connections, 332
 Urethra, male, 255
 curve of, 326
 incision into, 254, 260
 rupture, 254
 Uterine appendages, 335
 artery, 337
 plexus of nerves, 338
 Uterus, 332
 connections, 333
 ligaments, 334
- VAGINA, connections, 334
 Vaginal vessels, 338
 Vagus cranial nerve, 118, 200
 Vas deferens, 324
 Vastus externus, 367
 internus muscle, 368
 Vein, alveolar, 181
 auricular posterior, 164
- Vein, axillary, 10
 azygos large, 307
 basilic, 32
 brachial, 44
 cava inferior, 302
 cephalic, 27, 32
 circumflex iliac deep, 273
 superf. 262, 340
 deep cervical, 175
 diaphragmatic inferior, 302
 dorsal arch of foot, 456
 epigastric deep, 273, 340
 superficial, 262
 facial, 180
 deep, 181
 femoral, 364
 gluteal, 395
 hæmorrhoidal, upper, 329
 iliac, common, 301
 external, 301
 internal, 301
 innominate, 171
 jugular anterior, 162, 170
 external, 143, 162, 164
 internal, 163, 170
 laryngeal, 231
 lingual, 189
 lumbar, 305
 median of forearm, 31
 basilic, 31
 cephalic, 31
 maxillary internal, 164, 181
 mesenteric inferior, 302
 superior, 302
 nasal, 239
 ophthalmic, 123
 perinaal superficial, 253
 peroneal, 432
 popliteal, 400, 410
 portal, 302
 profunda, femoral, 377
 pterygoid, 181
 pudic external, 273, 340
 internal, 247, 259
 radial cutaneous, 31
 deep, 74
 renal, 302
 saphenous external, 416, 456
 internal, 340, 354, 416,
 456
 spermatic, 302
 subclavian, 170
 supra-renal, 302
 temporal, 164
 thyroid, 232
 tibial anterior, 467
 posterior, 431
 ulnar cutaneous, 31
 deep, 81
 vertebral, 168, 175

Vena cava inferior, 302
 superior, 171
 Vena portæ, 302
 Venæ cavæ hepaticæ, 302
 Venous arch of foot, 456
 Ventricle of larynx, 224
 Vertebral artery, 119, 169, 174
 vein, 168, 175
 Vessels of dura mater, 115
 Vesica urinaria, 322, 332
 Vesical arteries, 307, 328
 Vesico-uterine pouch, 335
 Vesiculæ seminales, 325
 Vocal cords, 223

Vocal cords, use of, 224

WOUNDS of arteries

 brachial, 34, 37
 dorsal of foot, 469
 palmar arch, superficial, 89
 deep, 98
 plantar arch, 454
 radial, 74
 tibial post., 430
 ulnar in forearm, 82
 Wharton's duct, 188
 Wrisberg's nerve, 39, 51
 cartilages, 220

THE END.

*Seventh Edition. Illustrated by 248 Engravings on Wood. Small 8vo.
12s. 6d., cloth.*

DEMONSTRATIONS OF ANATOMY ;

BEING

A GUIDE TO THE KNOWLEDGE OF THE HUMAN BODY BY DISSECTION.

By GEORGE VINER ELLIS,

PROFESSOR OF ANATOMY IN UNIVERSITY COLLEGE, LONDON.

The author has made the work a system of dissections of the whole body in parts or regions, in order that the knowledge obtained by its use may be practical rather than verbal. For the purpose of carrying out the plan proposed, he has divided the book into chapters and sections, and has included in each the dissection of one great division of the body, such as a limb, the thorax, the abdomen, the head and neck, etc., etc.

The dissection of each part is conducted by those steps found best adapted, after many years' experience in teaching, for the purpose of making a complete examination of all the structures of each particular region. Thus, beginning at the surface, attention is first directed to superficial marks as indices of the subjacent bone, vessels, or muscles ; next, the soft parts are observed in succession, with their natural position undisturbed ; and lastly, the individual joints are brought under the notice of the dissector. To enable the student to make progress without the constant superintendence of an instructor, full directions for the performance of the several manual proceedings are given, and the different objects that come into view on the removal of the more superficial layers are severally distinguished.

The anatomical description has been made topographical, so to say, in accordance with the peculiar plan of the work ; for only so much of a vessel, nerve, or muscle, is described, as may be laid bare by the dissection, in order that the student may not be perplexed by a reference to objects which are not seen.

LONDON : SMITH, ELDER, & CO., 15, WATERLOO PLACE.

ILLUSTRATIONS OF DISSECTIONS
OF THE
HUMAN BODY.

ILL

SEE

THE

MITT

ILLUSTRATIONS OF DISSECTIONS

IN A

SERIES OF ORIGINAL COLOURED PLATES,

THE SIZE OF LIFE,

REPRESENTING THE

DISSECTION OF THE HUMAN BODY.

BY

GEORGE VINER ELLIS,

PROFESSOR OF ANATOMY IN UNIVERSITY COLLEGE, LONDON;

AND

G. H. FORD, Esq.

THE DRAWINGS ARE FROM NATURE AND ON STONE BY MR. FORD,
FROM DISSECTIONS BY PROFESSOR ELLIS, AND FORM A
SEPARATE VOLUME IN IMPERIAL FOLIO.

SECOND EDITION.

LONDON:

SMITH, ELDER, & CO., 15, WATERLOO PLACE.

1876.

LONDON :
BRADBURY, AGNEW, & CO., PRINTERS, WHITEFRIARS.

Ar
ret
Su
and
exp
V
tion
trat
mus
laye
conn
same
Th
the v
Pelvi
size f
with
of Na
to im
Drawi
Anato
the St
since v
tionally

PREFACE.

THIS Volume contains a concise description of a series of Anatomical Plates in folio in a separate Atlas, with some remarks on the practical applications of Anatomical facts to Surgery. The purpose for which the Plates are designed, and the circumstances connected with their production are explained below.

With the view of carrying out the pictorial representation of dissections, the part of the Human Body to be illustrated is divided into suitable stages or regions; and the muscles, blood-vessels, and nerves of each region are shown in layers in the natural order of succession, so that their mutual connections may be brought before the eye at one and the same time.

The Illustrations comprise views of the Head and Neck, the upper Limb, the Perinæum, the Abdominal parietes, the Pelvis, and the lower Limb. All the Figures are drawn of life-size from actual dissections; and they are printed in colours with the object of making them as true pictures as possible of Nature, and more serviceable as copies for the Student to imitate. Only such dissections were prepared for the Drawings as may be commonly seen in the practical Anatomy Room; and the minute detail, whose counterpart the Student with average manual dexterity could not produce without some difficulty and loss of time, was intentionally omitted. Delineations of the ligaments, the viscera

of the cavities of the Body, and the organs of the Senses, are not included in the Plates now published.

The labour connected with this Work was divided between its two authors, that part being apportioned to each which he was best fitted by previous knowledge and experience to execute. To Mr. Ford were assigned the original Drawings, and the chromo-lithography; and to him is due the merit of portraying with so much effect and exactness the natural appearance of the parts dissected. Upon me rests the responsibility of the selection of the Illustrations, the fidelity of the dissections, and the accuracy of the whole.

During the progress of this undertaking, which was continued through several years, other engagements necessitated my having recourse occasionally to the senior Students of the College for the help of their hands. To those Students, and to Mr. Samuel Onley in particular, I gladly offer my thanks for their assistance. And to the late Mr. J. S. Cluff, Demonstrator of Anatomy, I am greatly indebted for the valuable aid he afforded me at all times.

Before closing this retrospect of the task now finished, I may advert to the difficulties attendant on the printing in colours of such complicated Figures, and to the successful way in which they were overcome by Mr. West.

GEORGE VINER ELLIS.

UNIV. COLL. LOND.,
May 1st, 1876.

	PAGE
PLATE V.—THE SHOULDER, AND THE MUSCLES AT THE BACK OF THE	
SCAPULA	52
Scapular and shoulder muscles	53
Arteries of the shoulder	57
Nerve of the shoulder	58
PLATE VI.—THE TRICEPS MUSCLE BEHIND THE HUMERUS, AND SOME	
SHOULDER MUSCLES	59
Triceps extensor muscle, and fracture of the olecranon	59
Arteries of the arm and shoulder	61
PLATE VII.—THE MUSCULO-SPIRAL NERVE IN THE ARM, AND THE	
PROFUNDA VESSELS	63
Muscles of the arm and shoulder	63
Vessels at the back of the arm	65
Nerves at the back of the arm	66
PLATE VIII.—SURFACE VIEW OF THE FOREARM, WITH THE PARTS	
UNDISTURBED	68
Superficial muscles	68
Hollow before the elbow	71
Radial artery and branches : ligature of	73
Nerves superficial in the forearm	76
PLATE IX.—DEEP VIEW OF THE FRONT OF THE FOREARM	77
Muscles of the deep layer	77
Ulnar artery and branches : ligature of	80
Nerves of the forearm	83
PLATE X.—SUPERFICIAL AND DEEP VIEWS OF THE PALM OF THE HAND	85
Fig. i. Central muscles of the palm	85
Superficial palmar arch : wounds of	88
Superficial nerves of the hand	91
Fig. ii. Short muscles of the digits	93
Radial artery and deep palmar arch	96
Deep nerve of the hand	98
PLATE XI.—SUPERFICIAL VIEW OF THE BACK OF THE FOREARM AND	
HAND	99
Superficial layer of muscles	99
Radial artery at the back of the hand	104
PLATE XII.—DEEP VIEW OF THE BACK OF THE FOREARM.	106
Muscles of the deep layer	106
Arteries at the back of the forearm	109
Nerve at the back of the forearm	110

THE HEAD AND NECK.

	PAGE
PLATE XIII.—BASE OF THE SKULL, AND FIRST AND SECOND VIEWS	
OF THE ORBIT	113
Fossæ of the base, and parts of the dura mater . . .	113
Cranial nerves in the skull	115
Vessels of the base of the skull	118
Highest muscles of the orbit, and the lachrymal gland	120
Vessels of the orbit	122
Superficial nerves of the orbit	123
PLATE XIV.—SINUSES OF THE DURA MATER, AND TWO DEEP VIEWS	
OF THE ORBIT	125
Sinuses of the dura mater	126
Deep muscles of the orbit	127
Nerves deep in the orbit	128
PLATE XV.—THE ANATOMY OF THE SIDE OF THE NECK BEHIND THE	
STERNO-MASTOID MUSCLE	131
Lateral muscles of the neck	131
Posterior triangular space—its boundaries and contents	135
Arteries in the space, and ligature of the third part of the subclavian	138
External jugular vein and blood-letting.	142
Nerves in the triangular space	144
PLATE XVI.—SURFACE VIEW OF THE NECK IN FRONT OF THE	
STERNO-MASTOIDEUS MUSCLE.	147
Surface objects visible without displacement of any part	147
Sterno-mastoideus and the fascia	148
Connections of the salivary glands	149
Superficial arteries of the neck	151
veins of the neck	152
Cutaneous nerves of the neck	152
PLATE XVII.—VIEW OF THE FRONT OF THE NECK AFTER DISPLACEMENT OF THE STERNO-MASTOIDEUS	153
Anterior triangular space	153
Anterior muscles of the neck	155
Carotid vessels, and ligature of	158
Veins of the front of the neck	163
Nerves of the fore part of the neck	164

	PAGE
PLATE XVIII.—THE SUBCLAVIAN ARTERY AND THE SURROUNDING PARTS	166
Muscles of the subclavian region	166
Subclavian artery and branches, with ligature of the second part	167
Subclavian and deep jugular veins	170
Nerves of the subclavian region	171
PLATE XIX.—A DEEP VIEW OF THE BACK OF THE NECK	172
Deep muscles behind the spine	172
Arteries at the back of the neck	174
Nerves at the back of the neck	175
PLATE XX.—SUPERFICIAL VIEW OF THE PTERYGOID REGION	176
Muscles of mastication	177
Internal maxillary artery and branches	178
Internal maxillary and facial veins	180
Branches of inferior maxillary nerve	181
PLATE XXI.—DEEP VIEW OF THE DISSECTION OF THE PTERYGOID REGION	182
Cranial branches of internal maxillary artery	182
Inferior maxillary nerve and branches	183
PLATE XXII.—THE ANATOMY OF THE SUBMAXILLARY REGION	186
Tongue and hyoid muscles	186
Salivary glands under the jaw	188
Lingual artery and vein	188
Nerves of tongue, and the submaxillary ganglion	189
PLATE XXIII.—UPPER MAXILLARY NERVE, AND DEEP PART OF THE INTERNAL MAXILLARY ARTERY	191
Some facial muscles	191
Terminal offsets of the maxillary artery	192
Upper maxillary and facial nerves	193
PLATE XXIV.—INTERNAL CAROTID AND ASCENDING PHARYNGEAL ARTERIES, AND CRANIAL NERVES IN THE NECK	195
Deep muscles in front of the spine	195
Carotid and ascending pharyngeal arteries	197
Cranial, spinal, and sympathetic nerves in the neck	199
PLATE XXV.—EXTERNAL VIEW OF THE PHARYNX WITH ITS MUSCLES	205
The pharynx and its muscles	206
Some nerves and vessels of the larynx	208

PLATE XXVI.—INTERIOR OF THE PHARYNX, AND THE MUSCLES OF	
THE SOFT PALATE	209
Cavity of the pharynx, and its openings	209
The soft palate and the tonsil	213
Muscles of the soft palate, and use of the part	214
PLATE XXVII.—LARYNX AND VOCAL APPARATUS, WITH THE MUSCLES,	
VESSELS, AND NERVES	218
Figs. ii. and iii. Cartilages of larynx, and hyoid bone	218
Articulations of laryngeal cartilages	221
Interior of larynx, and vocal apparatus	223
Fig. i. Muscles of the larynx governing the size of the glottis and the pitch of the voice	226
Nerves of the larynx, and use	229
Vessels of the larynx	231
Thyroid body and the trachea	232
PLATE XXVIII.—NOSE CAVITY WITH THE BOUNDARIES AND OPENINGS	
INTO IT	233
Cavity of the nose and its bounds	234
Spongy bones and the meatuses	236
Mucous membrane and bloodvessels	238
Olfactory region and nerves of the nose	239

THE PERINÆUM.

PLATE XXIX.—ANATOMY OF THE POSTERIOR HALF, OR THE ANAL	
PART OF THE PERINÆUM IN THE MALE	241
End of the rectum with its muscles	241
Ischio-rectal fossa	245
Bloodvessels and nerves of the part	246
First stage of lithotomy	248
PLATE XXX.—SUPERFICIAL VIEW OF THE ANTERIOR OR URETHRAL	
HALF OF THE MALE PERINÆUM	249
Tube of the urethra with its muscles	249
Superficial perinæal vessels and nerves	253
Accessibility of the urethral tube	254
PLATE XXXI.—DEEP VIEW OF THE ANTERIOR HALF OF THE PERINÆUM	
OF THE MALE	255
Triangular ligament with the urethra in it	255
Muscles of the membranous part of the urethra	257
Pudic vessels and their deep branches	258
Pudic nerve and its deep branches	259
Second stage in the operation of lithotomy	260

THE ABDOMINAL PARIETES.

	PAGE
PLATE XXXII.—FIRST VIEW OF THE ABDOMINAL WALL IN THE IN-	
GUINAL REGION	261
Superficial fascia, vessels, and glands	261
Aponeurosis of the external oblique, with Poupart's	
ligament and the abdominal ring	263
Cutaneous vessels and nerves	266
PLATE XXXIII.—SECOND VIEW OF THE ABDOMINAL WALL IN THE	
INGUINAL REGION	267
Internal oblique and cremaster muscles	267
Iliac branches of the lumbar plexus	269
PLATE XXXIV.—THIRD VIEW OF THE ABDOMINAL WALL IN THE IN-	
GUINAL REGION	270
Transversalis muscle and fascia	270
Abdominal ring and spermatic cord	271
External inguinal hernia	273
Congenital and infantile varieties	277
Internal inguinal hernia	279
Variety of internal hernia	282
PLATE XXXV.—INNER VIEW OF THE WALL OF THE ABDOMEN IN THE	
INGUINAL REGION	284
Membranes lining the abdominal wall	284
Abdominal and crural rings	285
Anatomy of femoral hernia, in part	288
External iliac artery and branches	289
Ligature of the iliac artery	290
PLATE XXXVI.—DEEP MUSCLES OF THE ABDOMINAL PARIETES, AND	
VESSELS OF THE CAVITY	292
Diaphragm, and muscles of the loins	293
Aorta, and inferior cava, with their branches	298
Nerves of the parietes	303
PLATE XXXVII.—INTERNAL ILIAC ARTERY, AND LUMBAR AND SACRAL	
PLEXUSES	304
Parietal branches of arteries, and the internal iliac	
trunk	304
Lumbar plexus and branches	308
Sacral plexus and branches	310
Lumbar and sacral parts of the cord of the sym-	
pathetic	310

THE PELVIS.

	PAGE
PLATE XXXVIII.—FIRST SIDE VIEW OF THE MALE PELVIS WITH	
THE MUSCLES BOUNDING IT BELOW	312
Muscles closing the pelvic outlet laterally	312
Pudic artery and some offsets	314
Pudic nerve and its offsets	316
PLATE XXXIX.—SECOND VIEW OF THE MALE PELVIS SHOWING THE	
FASCIA IN THE INTERIOR	317
Arrangement of the recto-vesical fascia	317
PLATE XL.—SIDE VIEW OF THE VISCERA OF THE MALE PELVIS	320
Connections of the rectum	321
of the urinary bladder	322
Ligaments of the bladder	323
Recto-vesical pouch of peritoneum	324
Prostate and vesicula seminalis	325
Curve of the male urethra	326
Third stage of the operation for lithotomy	327
Visceral arteries of the pelvis	328
Nerves of the pelvis to muscles and viscera	329
PLATE XLI.—SIDE VIEW OF THE VISCERA OF THE FEMALE	
PELVIS	331
Connections of the rectum	331
bladder and urethra	332
uterus and vagina	332
Peritoneum and its pouches	334
Appendages of the uterus	335
Visceral arteries of the pelvis	336
Visceral nerves of the pelvis	338

THE LOWER LIMB.

PLATE XLII.—THE SUPERFICIAL PARTS OF THE GROIN, AND THE	
FASCIA LATA AT THE TOP OF THE THIGH	339
Superficial vessels and nerves, and glands	339
Fascia lata and the saphenous opening	341
PLATE XLIII.—ANATOMY OF THE PARTS CONCERNED IN FEMORAL	
HERNIA	344
Crural sheath, with the crural ring and canal	345
Femoral hernia surgically considered	347

	PAGE
PLATE XLIV.—SURFACE VIEW OF THE THIGH, WITH THE CUTANEOUS	
NERVES AND VESSELS	351
Superficial nerves and vessels	351
Scarpa's triangular space	354
Surface view of the superficial muscles	356
PLATE XLV.—ANATOMY OF THE FEMORAL VESSELS, AND THE ANTERIOR	
CRURAL NERVE	358
Femoral artery and vein with their branches ; and	
ligature of the artery	358
Anterior crural nerve and branches	364
PLATE XLVI.—DEEP VIEW OF THE FORE AND OUTER PARTS OF THE	
THIGH	366
Muscles on the front of the thigh	366
External circumflex vessels of the profunda	370
Nerves of the front of the thigh	370
PLATE XLVII.—MUSCLES INSIDE THE FEMUR WITH THEIR VESSELS	
AND NERVES	371
Adductor muscles of the hip-joint	372
Profunda vessels of the thigh	375
Obturator nerve and its branches	377
PLATE XLVIII.—FIRST STAGE IN THE DISSECTION OF THE BUT-	
TOCK	379
Cutaneous nerves and vessels	379
Gluteus maximus muscle	381
PLATE XLIX.—SECOND STAGE IN THE DISSECTION OF THE BUT-	
TOCK	382
Gluteus medius, and external rotators	383
Superficial arteries of the buttock	387
Superficial nerves of the buttock	388
PLATE L.—THIRD STAGE IN THE DISSECTION OF THE BUTTOCK	390
Deep muscles, and the sacro-sciatic ligaments	391
Deep arteries of the buttock	394
Deep nerves of the gluteal region	396
PLATE LI.—COMMON VIEW OF THE POPLITEAL SPACE WITH ITS CON-	
TENTS	397
Form, size, and boundaries of the ham	398
Situation of vessels in the ham	399
Nerves, lymphatics, and fat in the ham	401

	PAGE
PLATE LII.—A REPRESENTATION OF THE BACK OF THE THIGH	402
Muscles behind the femur	403
Vessels at the back of the thigh, with the popliteal vessels	405
Sciatic and popliteal nerves	410
PLATE LIII.—VIEW OF THE HAM UNDISTURBED, AND THE FIRST STAGE OF THE BACK OF THE LEG	413
Cutaneous nerves of the leg, behind	414
Superficial vessels of the back of the leg	415
Muscles of the calf, and natural appearance of the ham	416
PLATE LIV.—DEEP MUSCLES OF THE CALF, AND THE POPLITEAL VESSELS AND NERVES	418
Soleus and plantaris muscles	419
Lower end of the popliteal vessels	421
Deep branches of internal popliteal nerve	423
PLATE LV.—DEEP DISSECTION OF THE BACK OF THE LEG	424
Deep muscles behind the leg-bones	424
Posterior tibial vessels, with wounds, and ligature of the artery	427
Posterior tibial nerve	432
PLATE LVI.—FIRST AND SECOND STAGES IN THE EXAMINATION OF THE SOLE OF THE FOOT	434
Fig. i. First layer of muscles	434
Superficial arteries of the sole	436
Plantar nerves	438
Fig. ii. Second layer of foot-muscles	441
Course of the external plantar artery and nerve	444
PLATE LVII.—THIRD AND FOURTH STAGES OF THE DISSECTION OF THE SOLE OF THE FOOT	445
Fig. i. Short muscles of the great and little toes, forming the third layer	446
External plantar nerve and branches	447
External plantar artery	449
Fig. ii. Interossei muscles, and tendons of the tibialis posticus and peroneus longus	451
Plantar arch, and ending of the dorsal artery of the foot	453

	PAGE
PLATE LVIII.—FRONT OF THE LEG AND DORSUM OF THE FOOT	456
Cutaneous veins and arteries.	456
Cutaneous nerves of the leg and foot	457
Muscles of the front of the leg and foot.	459
External lateral muscles of the leg	463
Anterior tibial vessels, and wounds and ligature of the artery.	464
Anterior tibial and musculo-cutaneous nerves	469



